Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan and A. A. Sonzogni	NDS 115, 135 (2014)	1-Nov-2013

Q(β^-)=−7.45×10^3 *6*; S(n)=12353 *7*; S(p)=7899 *6*; Q(α)=−5404 *6* 2012Wa38
S(2n)=21802 *7*; S(2p)=13683 *6* (2012Wa38).
α: Additional information 1.

^{88}Zr Levels

Cross Reference (XREF) Flags

A	^{88}Nb ε decay (14.55 min)	E	^{74}Ge(^{18}O,4nγ)	I	^{90}Zr(p,t)
B	^{88}Nb ε decay (7.78 min)	F	^{86}Sr(α,2nγ)	J	^{92}Mo(d,^{6}Li)
C	^{88}Zr IT decay (1.320 μs)	G	^{89}Y(α,p4nγ)		
D	^{12}C(^{84}Sr,^{88}Zrγ)	H	^{89}Y(p,2nγ)		

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	XREF	Comments
0.0	0$^+$	83.4 d *3*	ABCDEFGHIJ	%ε=100 T$_{1/2}$: from 1973St29. Others: 82.6 d *2* (private communication quoted by 1984Pr01), 85 d (1953Hy52). δ<r^2>^{90,88}=0.061 fm^2 *5* (2013An02, 2003Th03).
1057.03 *4*	2$^+$	2.50 ps *28*	ABCDEFGHIJ	μ=+0.60 *22* J$^\pi$: E2 1057γ to 0$^+$, L(p,t)=2. T$_{1/2}$: from DSAM in ^{12}C(^{84}Sr,^{88}Zrγ). Other: 0.83 ps *+4−2* from DSAM in ^{89}Y(p,2nγ). μ: from transient field technique in ^{12}C(^{84}Sr,^{88}Zrγ).
1521.4 *7*	0$^+$		HIJ	J$^\pi$: L(p,t)=0.
1817.86 *6*	2$^+$	0.59 ps *5*	B D FGHIJ	J$^\pi$: L(d,^{6}Li)=2; L(p,t)=(2), $\gamma\gamma(\theta)$ in ^{89}Y(p,2nγ). T$_{1/2}$: from DSAM in ^{12}C(^{84}Sr,^{88}Zrγ). Other: 0.21 ps *9* from DSAM in ^{89}Y(p,2nγ).
2139.59 *5*	4$^+$	1.52 ps *14*	ABCDEFGHIJ	μ=+2.6 *7* J$^\pi$: L(p,t)=4. T$_{1/2}$: from DSAM in ^{12}C(^{84}Sr,^{88}Zrγ). μ: from transient field technique in ^{12}C(^{84}Sr,^{88}Zrγ).
2231.0[@] *5*	0$^+$		HIJ	J$^\pi$: L(p,t)=0.
2455.88 *7*	3$^-$	1.94 ps *21*	B D FGHIJ	J$^\pi$: L(p,t)=3. T$_{1/2}$: from DSAM in ^{12}C(^{84}Sr,^{88}Zrγ).
2539.00 *6*	5$^-$		ABC EFGHI	J$^\pi$: L(p,t)=5.
2568.3 *3*	2$^+$		HIJ	J$^\pi$: L(p,t)=2.
2605.20 *14*	4$^+$		B F I	J$^\pi$: L(p,t)=4.
2673.7 *5*			B	
2801.13 *8*	5$^-$		AB EFGHIJ	J$^\pi$: L(p,t)=5.
2810.80 *6*	6$^+$		A C EFGHI	J$^\pi$: L(p,t)=6.
2887.79 *6*	8$^+$	1.320 μs *25*	A C EFGHI	%IT=100 Q=+0.51 *3*; μ=−1.811 *16* J$^\pi$: E2 77γ to 6$^+$, L(p,t)=(8,6). T$_{1/2}$: from γ(t) (1978Ha52). Others: 1.41 μs *+12−9* (2004Ch35) using γ(t); 1.28 μs *10*, 1.75 μs *20* from γ(t) in ^{89}Y(p,2nγ). μ: from g=−0.2264 *20* measured by γ(H,θ,t) in heavy-ion reactions (1978Ha52). Other: g=−0.20 *2* from ^{89}Y(p,2nγ). Q: from time-differential perturbed γ-ray angular distribution of ions implanted in non-cubic crystals (1985Ra09). Sign determined by 1986Be06.
2888 *3*	(2$^+$)		I	J$^\pi$: L(p,t)=(2).
2928 *3*	3$^-$		I	J$^\pi$: L(p,t)=3.

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Adopted Levels, Gammas (continued)

^{88}Zr Levels (continued)

E(level)†	Jπ	$T_{1/2}$‡	XREF	Comments
2989.67 *7*	5⁻		B HI	Jπ: L(p,t)=5.
2998.4 *3*			B	
3027 *3*	2⁺		I	Jπ: L(p,t)=2.
3032.77 *8*	3⁻		B I	Jπ: L(p,t)=3.
3074.9@ *3*	(4⁺)		HI	Jπ: L(p,t)=(4).
3093.6@ *3*	5⁻		HI	Jπ: L(p,t)=5.
3213.70 *11*	(6⁺)		A	Jπ: log *ft*=7.5 from (8⁺), 1074γ to 4⁺.
3223.8 *4*			B	
3277.01 *8*	(3⁻,4,5⁻)		B	Jπ: 287γ to 5⁻, 821γ to 3⁻.
3.30×10^3			I	
3374.37 *9*	(3⁻,4,5⁻)		B	Jπ: 573γ to 5⁻, 918.5γ to 3⁻.
3390.70 *6*	8⁺	21 ps *1*	A EFGH	Jπ: from γ(θ) and linear polarization in ^{74}Ge(^{18}O,4nγ).
3426.47 *17*			B	
3.43×10^3	(0⁺)		I	Jπ: L(p,t)=(0).
3483.63 *13*	(7⁻)		A EFG	Jπ: 7,9,11 from γ(θ) and linear polarization of populating 1003γ in ^{74}Ge(^{18}O,4nγ), 944.5γ to 5⁻.
3568.18 *15*	(3,4⁺)		B	Jπ: log *ft*=6.8 from (4⁻), 2511γ to 2⁺.
3617.44 *24*	(7⁻)		A FG	Jπ: J=7 from γ(θ) in ^{89}Y(α,p4nγ), 817γ to 5⁻.
3637.76 *15*	(3,4⁺)		B	Jπ: log *ft*=6.7 from (4⁻), 2581γ to 2⁺.
3875.04 *14*	(3⁻,4,5⁻)		B	Jπ: 1336γ to 5⁻, 1419γ to 3⁻.
3938.28 *14*	(3,4,5)		B	Jπ: log ϕt=6.3 from (4⁻).
3947.58 *13*	(3,4,5)		B	Jπ: log *ft*=6.2 from (4⁻).
3968.2 *3*	(3⁻,4,5)		B	Jπ: log *ft*=6.8 from (4⁻), 1429γ to 5⁻.
3.99×10^3?			I	Possibly identical to one of the neighboring levels.
4024.9 *3*	(3⁻,4,5)		B	Jπ: log *ft*=6.9 from (4⁻), 1224γ to 5⁻.
4059.22 *14*	(3⁻,4,5⁻)		B	Jπ: 1520γ to 5⁻, 1604γ to 3⁻.
4084.22 *13*	(3⁻,4,5)		B	Jπ: log *ft*=6.1 from (4⁻), 1095γ to 5⁻.
4112.38 *13*	(3,4,5)		B	Jπ: log *ft*=6.5 from (4⁻).
4155.5 *4*	(3,4,5)		B	Jπ: log *ft*=7.1 from (4⁻).
4.17×10^3?			I	Possibly identical to one of the neighboring levels.
4206.1 *3*	(3,4,5⁻)		B	Jπ: log *ft*=6.6 from (4⁻), 1750γ to 3⁻.
4208.17 *10*	(3⁻,4,5⁻)		B	Jπ: 1407γ to 5⁻, 1752γ to 3⁻.
4237.0 *4*	(7,8⁺)		A	Jπ: log *ft*=7.1 from (8⁺), 1426γ to 6⁺.
4307.9 *3*	(3⁻,4,5⁻)		B	Jπ: 1319γ to 5⁻, 1852γ to 3⁻.
4335.6 *4*	(3,4⁺)		B	Jπ: log *ft*=7.0 from (4⁻), 3278.5γ to 2⁺.
4348.3 *3*			A	
4.37×10^3?			I	Possibly identical to one of the neighboring levels.
4388.34 *25*	(7,8⁺)		A	Jπ: log *ft*=6.9 from (8⁺), 1175γ to (6⁺).
4413.07 *11*	10⁺	<1.4 ps	EF	Jπ: E2 1022γ to 8⁺, γ(θ) and linear polarization in ^{74}Ge(^{18}O,4nγ).
4461.88 *22*	(7,8⁺)		A	Jπ: log *ft*=6.4 from (8⁺), 1652γ to 6⁺.
4486.31 *12*	(9⁻)		EFG	Jπ: (E2) 1003γ to (7⁻), (E1) 1096γ to 8⁺.
4612.29 *11*	9⁺	<0.17 ns	A EFG	Jπ: 7⁺,9⁺ from γ(θ) and linear polarization in ^{74}Ge(^{18}O,4nγ). Probable 199γ to 10⁺.
4672.7 *3*	(3⁻,4,5)		B	Jπ: log *ft*=6.8 from (4⁻), 1871.5γ to 5⁻.
4713.08 *11*	10⁻#	2.25 ns *17*	EFG	
4797.63 *11*	11⁻#	50 ps *4*	EFG	
4934.5 *3*	(7,8⁺)		A	Jπ: log *ft*=6.2 from (8⁺), 1721γ to (6⁺).
5087.9 *3*	(7,8⁺)		A	Jπ: log *ft*=6.5 from (8⁺), 2277γ to 6⁺.
5166.2? *4*	(10,11,12)#	0.66 ps *14*	EF	
5229.47 *13*	12⁺	10 ps *1*	EFG	Jπ: E2 816γ to 10⁺.
5583.85 *12*	12⁻#	<0.7 ps	EFG	
5665.91 *15*	12⁺#	0.28 ps *10*	EFG	

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Adopted Levels, Gammas (continued)

^{88}Zr Levels (continued)

E(level)[†]	J^{π}	$T_{1/2}$[‡]	XREF	Comments
5787.2 *5*	(7,8,9)		A	J^{π}: log *ft*=6.2 from (8^+).
5950.75 *16*	$(13)^+$	<0.10 ps	EFG	J^{π}: $(11,13)^+$ from $\gamma(\theta)$ and transition strength in ^{74}Ge(^{18}O,4nγ). High spin favored in heavy ion fusion reactions.
6000.8? *3*	$(13)^-$[#]	<0.7 ps	E	
6032.52? *13*	(12^-)[#]		E	
6192.94 *12*	13^-	1.70 ps *14*	E	J^{π}: E2 1395γ to 11^-.
6238.79 *16*	$(14)^+$[#]	1.0 ps *3*	E	
6501.32 *24*	$(14)^+$[#]	0.16 ps *3*	E	
6578.2 *5*			E	
6765.33 *23*	$(14)^-$[#]	≤0.49 ps	E	
6826.66 *23*	$(15)^+$[#]	0.10 ps *2*	E	
7228.2 *3*	$(15)^-$[#]	≤0.8 ps	E	
7431.9 *4*		0.10 ps *3*	E	
7536.5 *4*	(15^-)[#]	≤0.33 ps	E	
7878.9 *4*	(16^-)[#]	≤0.50 ps	E	
8200.2 *5*	(17^-)[#]	0.3 ps *+4−1*	E	
8925.2 *5*	(18^-)[#]	<0.3 ps	E	
9912.6? *5*	(19^-)[#]	>0.7 ps	E	
10557.3? *9*	(20)[#]	≤0.1 ps	E	
11199.7? *11*	(21)[#]	0.22 ps *14*	E	

[†] Level energies with ΔE≤1 keV are from a least-squares fit to the Adopted Gammas, except where noted. Those with ΔE>1 keV are from (p,t).
[‡] From Doppler-shift attenuation and Recoil-distance Doppler-shift in ^{74}Ge(^{18}O,4nγ), except where noted.
[#] From $\gamma(\theta)$, linear polarization and γ decay pattern in ^{74}Ge(^{18}O,4nγ).
[@] From ^{89}Y(p,2nγ). 2009Br05 quote precise level energies but do not provide the γ-ray energies of the depopulating transitions.

Adopted Levels, Gammas (continued)

$\gamma(^{88}Zr)$

E_i(level)	J^{π}_i	E_{γ}†	I_{γ}†	E_f	J^{π}_f	Mult.‡	δ‡	α	$I_{(\gamma+ce)}$#	Comments
1057.03	2^+	1057.01 *4*	100	0.0	0^+	E2		5.91×10^{-4}		α(K)=0.000522 *8*; α(L)=5.79×10^{-5} *9*; α(M)=1.003×10^{-5} *14*; α(N)=1.422×10^{-6} *20*; α(O)=9.95×10^{-8} *14* B(E2)(W.u.)=7.4 *9*
1521.4	0^+	464.5		1057.03	2^+	[E2]		0.00524	100	ce(K)/(γ+ce)=0.00457 *7*; ce(L)/(γ+ce)=0.000536 *8*; ce(M)/(γ+ce)=9.31×10^{-5} *13*; ce(N)/(γ+ce)=1.304×10^{-5} *19* ce(O)/(γ+ce)=8.51×10^{-7} *12* α(K)=0.00459 *7*; α(L)=0.000539 *8*; α(M)=9.36×10^{-5} *14*; α(N)=1.311×10^{-5} *19*; α(O)=8.56×10^{-7} *12*
		1521.2		0.0	0^+	(E0)			0.05 *1*	Mult.: from ce. No corresponding γ observed. X(E0/E2)=0.0050 *11* (2005Ki02).
1817.86	2^+	760.76 *9*	100.0 *27*	1057.03	2^+	M1+E2	+0.26 *4*	1.23×10^{-3}		α(K)=0.001083 *16*; α(L)=0.0001195 *17*; α(M)=2.07×10^{-5} *3*; α(N)=2.95×10^{-6} *5*; α(O)=2.10×10^{-7} *3* B(E2)(W.u.)=6.5 *20*; B(M1)(W.u.)=0.051 *5* Mult.: D+Q from $\gamma\gamma(\theta)$ in ^{89}Y(p,2nγ), $\Delta\pi$=no from level scheme. δ: from $\gamma\gamma(\theta)$ in ^{89}Y(p,2nγ). Other: −0.10 *13* from $\gamma(\theta)$ in ^{86}Sr(α,2nγ).
		1817.89 *9*	56.7 *12*	0.0	0^+	[E2]		4.14×10^{-4}		α(K)=0.0001716 *24*; α(L)=1.87×10^{-5} *3*; α(M)=3.23×10^{-6} *5*; α(N)=4.60×10^{-7} *7*; α(O)=3.28×10^{-8} *5* B(E2)(W.u.)=0.75 *7* I_{γ}: from ^{88}Nb ε decay (7.78 min). Others: 21 *21* from ^{89}Y(α,p4nγ) and 72 from ^{89}Y(p,2nγ).
2139.59	4^+	1082.53 *4*	100	1057.03	2^+	E2		5.61×10^{-4}		α(K)=0.000495 *7*; α(L)=5.48×10^{-5} *8*; α(M)=9.50×10^{-6} *14*; α(N)=1.347×10^{-6} *19*; α(O)=9.44×10^{-8} *14* B(E2)(W.u.)=10.8 *10*
2455.88	3^-	316.3 *2*	3.74 *15*	2139.59	4^+	[E1]		0.00421		α(K)=0.00371 *6*; α(L)=0.000411 *6*; α(M)=7.10×10^{-5} *10*; α(N)=1.003×10^{-5} *15*; α(O)=6.87×10^{-7} *10* B(E1)(W.u.)=0.000184 *22*
		638.00 *9*	100 *3*	1817.86	2^+	[E1]		7.33×10^{-4}		α(K)=0.000648 *9*; α(L)=7.10×10^{-5} *10*; α(M)=1.228×10^{-5} *18*; α(N)=1.742×10^{-6} *25* α(O)=1.223×10^{-7} *18* B(E1)(W.u.)=0.00060 *7*
		1399.40 *20*	9.5 *11*	1057.03	2^+	[E1]		3.28×10^{-4}		α(K)=0.0001391 *20*; α(L)=1.502×10^{-5} *21*; α(M)=2.60×10^{-6} *4*; α(N)=3.70×10^{-7} *6*;

$\gamma(^{88}\mathrm{Zr})$ (continued)

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡	δ ‡	α	Comments
									α(O)=2.64×10^{-8} *4* B(E1)(W.u.)=5.4×10^{-6} *9* I_γ: from ^{88}Nb ε decay (7.78 min). Other: 11.8 from ^{89}Y(p,2nγ).
2539.00	5^-	399.41 *3*	100	2139.59	4^+	E1		0.00227	α(K)=0.00201 *3*; α(L)=0.000221 *3*; α(M)=3.83×10^{-5} *6*; α(N)=5.41×10^{-6} *8*; α(O)=3.75×10^{-7} *6*
2568.3	2^+	1511.3 *3*	100	1057.03	2^+	M1+E2	−0.54 *22*	3.61×10^{-4} *6*	α(K)=0.000252 *4*; α(L)=2.74×10^{-5} *4*; α(M)=4.75×10^{-6} *7*; α(N)=6.76×10^{-7} *10*; α(O)=4.84×10^{-8} *8* Mult.: D+Q from $\gamma\gamma(\theta)$ in ^{89}Y(p,2nγ), $\Delta\pi$=no from level scheme. δ: from $\gamma\gamma(\theta)$ in ^{89}Y(p,2nγ).
2605.20	4^+	465. *2*	100.0 *9*	2139.59	4^+				
		1548.2 *2*	68 *5*	1057.03	2^+	[E2]		3.67×10^{-4}	α(K)=0.000234 *4*; α(L)=2.55×10^{-5} *4*; α(M)=4.43×10^{-6} *7*; α(N)=6.29×10^{-7} *9*; α(O)=4.47×10^{-8} *7*
2673.7		134.6 *5*	100	2539.00	5^-				
2801.13	5^-	262.04 *13*	100 *3*	2539.00	5^-	M1(+E2)	+0.3 *6*	0.017 *7*	α(K)=0.015 *6*; α(L)=0.0017 *9*; α(M)=0.00030 *15*; α(N)=4.3×10^{-5} *20*; α(O)=2.9×10^{-6} *10* Mult.: D(+Q) from $\gamma(\theta)$ in ^{86}Sr(α,2nγ), $\Delta\pi$=no from level scheme. δ: from $\gamma\gamma(\theta)$ in ^{89}Y(p,2nγ).
		661.60 *10*	19.6 *10*	2139.59	4^+	[E1]		6.76×10^{-4}	α(K)=0.000598 *9*; α(L)=6.54×10^{-5} *10*; α(M)=1.132×10^{-5} *16*; α(N)=1.606×10^{-6} *23* α(O)=1.128×10^{-7} *16*
2810.80	6^+	271.81 *2*	49.9 *18*	2539.00	5^-	E1		0.00637	α(K)exp=0.0046 *12* α(K)=0.00562 *8*; α(L)=0.000623 *9*; α(M)=0.0001077 *15*; α(N)=1.518×10^{-5} *22* α(O)=1.034×10^{-6} *15* α(K)exp: from ^{88}Nb ε decay (14.55 min).
		671.20 *4*	100.0 *13*	2139.59	4^+	E2		0.00181	α(K)=0.001595 *23*; α(L)=0.000182 *3*; α(M)=3.15×10^{-5} *5*; α(N)=4.44×10^{-6} *7*; α(O)=3.02×10^{-7} *5*
2887.79	8^+	76.99 *1*	100	2810.80	6^+	E2		2.87	α(K)=2.29 *4*; α(L)=0.487 *7*; α(M)=0.0856 *12*; α(N)=0.01103 *16*; α(O)=0.000355 *5* B(E2)(W.u.)=1.75 *4* Mult.: from K/L/M measured in ^{88}Nb ε decay (14.55 min).
2989.67	5^-	189.1 *3*	1.20 *15*	2801.13	5^-				
		384.6 *3*	<1.3	2605.20	4^+				
		450.52 *16*	100.0 *30*	2539.00	5^-				
		533.82 *9*	46.3 *15*	2455.88	3^-	[E2]		0.00345	α(K)=0.00303 *5*; α(L)=0.000351 *5*; α(M)=6.10×10^{-5} *9*; α(N)=8.56×10^{-6} *12*; α(O)=5.68×10^{-7} *8*
		850.0 *1*	7.5 *3*	2139.59	4^+				
2998.4		542.9 *5*	100 *50*	2455.88	3^-				
		1180.4[b] *4*	370 *60*	1817.86	2^+				

γ(^{88}Zr) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
3032.77	3^-	576.7 *2*	18.5 *8*	2455.88	3^-				
		892.8 *5*	9.9 *10*	2139.59	4^+				
		1975.7 *1*	100 *3*	1057.03	2^+				
3213.70	(6^+)	402.9[@]	34 *11*	2810.80	6^+				
		1074.1 *1*	100 *15*	2139.59	4^+				
3223.8		684.8 *4*	100	2539.00	5^-				
3277.01	$(3^-,4,5^-)$	244.2 *2*	12.1 *11*	3032.77	3^-				
		287.3 *2*	25.3 *16*	2989.67	5^-				
		476.0 *3*	15.3 *21*	2801.13	5^-				
		671.9[@]	100 *16*	2605.20	4^+				
		738.0[a] *1*	<59[a]	2539.00	5^-				
		821.2 *1*	57.4 *26*	2455.88	3^-				
3374.37	$(3^-,4,5^-)$	97.4[@] *10*	2.5 *9*	3277.01	$(3^-,4,5^-)$				
		384.6[a] *3*	<4.9[a]	2989.67	5^-				
		573.20[a] *10*	<52[a]	2801.13	5^-				
		835.5[a] *5*	<3.3[a]	2539.00	5^-				
		918.50 *10*	100 *6*	2455.88	3^-				
3390.70	8^+	177.0[@]	0.10 *10*	3213.70	(6^+)				
		502.91 *3*	100.0 *10*	2887.79	8^+	M1+E2	−0.15 *7*	0.00317	α(K)=0.00280 *5*; α(L)=0.000312 *6*; α(M)=5.41×10^{-5} *9*; α(N)=7.69×10^{-6} *13*; α(O)=5.44×10^{-7} *9* B(E2)(W.u.)=0.8 *8*; B(M1)(W.u.)=0.0080 *5* δ: Other: −0.06 *9* from $\gamma(\theta)$ in ^{86}Sr(α,2nγ).
3426.47		625.3 *2*	100 *4*	2801.13	5^-				
		1286.9 *3*	43 *4*	2139.59	4^+				
3483.63	(7^-)	672.8[@]	70 *30*	2810.80	6^+				
		944.51 *24*	100 *8*	2539.00	5^-				
3568.18	$(3,4^+)$	1112.30 *20*	85 *6*	2455.88	3^-				
		2511.10 *20*	100 *6*	1057.03	2^+				
3617.44	(7^-)	806.6 *3*	86 *17*	2810.80	6^+	(E1)		4.42×10^{-4}	α(K)=0.000391 *6*; α(L)=4.26×10^{-5} *6*; α(M)=7.38×10^{-6} *11*; α(N)=1.048×10^{-6} *15*; α(O)=7.40×10^{-8} *11* Mult.: D from $\gamma(\theta)$ in ^{89}Y(α,p4nγ), $\Delta\pi$=yes from level scheme.
		816.7 *7*	100 *14*	2801.13	5^-				
3637.76	$(3,4^+)$	604.8 *2*	33 *4*	3032.77	3^-				
		1497.8 *10*	12 *4*	2139.59	4^+				
		2580.9 *2*	100 *4*	1057.03	2^+				
3875.04	$(3^-,4,5^-)$	598.1 *3*	61 *4*	3277.01	$(3^-,4,5^-)$				
		885.0[b] *5*	16 *5*	2989.67	5^-				
		1336.0 *2*	96 *8*	2539.00	5^-				
		1419.2 *2*	100 *5*	2455.88	3^-				

$^{88}_{40}Zr_{48}$-6

Adopted Levels, Gammas (continued)

$\gamma(^{88}\mathrm{Zr})$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f
3938.28	(3,4,5)	564.1 4	7.1 13	3374.37	(3⁻,4,5⁻)
		1137.3[b] 10	9 4	2801.13	5⁻
		1399.4 2	100 13	2539.00	5⁻
		1482.2[b] 2	17.1 17	2455.88	3⁻
3947.58	(3,4,5)	573.20[a] 10	[a]	3374.37	(3⁻,4,5⁻)
		949.4[b] 5		2998.4	
		1342.4[b] 20		2605.20	4⁺
3968.2	(3⁻,4,5)	1167.0 5	39 6	2801.13	5⁻
		1429.2 3	100 11	2539.00	5⁻
4024.9	(3⁻,4,5)	1223.8 3	100	2801.13	5⁻
4059.22	(3⁻,4,5⁻)	1026.3 2	44 4	3032.77	3⁻
		1069.7 5	58 23	2989.67	5⁻
		1520.2 2	100 5	2539.00	5⁻
		1603.6 3	41 4	2455.88	3⁻
4084.22	(3⁻,4,5)	657.6 5	43 4	3426.47	
		709.6 3	20.0 29	3374.37	(3⁻,4,5⁻)
		1094.6 2	100 6	2989.67	5⁻
		1283.3 3	26 4	2801.13	5⁻
		1479.0 2	95 6	2605.20	4⁺
		1545.2[@]	36 5	2539.00	5⁻
		1944.5 10	14 5	2139.59	4⁺
4112.38	(3,4,5)	738.00[&] 10		3374.37	(3⁻,4,5⁻)
		835.5[&] 5		3277.01	(3⁻,4,5⁻)
4155.5	(3,4,5)	781.1 4	100	3374.37	(3⁻,4,5⁻)
4206.1	(3,4,5⁻)	1173.5[b] 5	32 8	3032.77	3⁻
		1532.2[b] 10	20 8	2673.7	
		1750.2 3	100 9	2455.88	3⁻
4208.17	(3⁻,4,5⁻)	781.7[@b]		3426.47	
		931.2 1	73 4	3277.01	(3⁻,4,5⁻)
		1209.0[b] 10	5 3	2998.4	
		1218.2 4	23 4	2989.67	5⁻
		1406.8 2	72 3	2801.13	5⁻
		1752.4 2	100 5	2455.88	3⁻
4237.0	(7,8⁺)	1349.1 5	100 18	2887.79	8⁺
		1426.3 6	85 27	2810.80	6⁺
4307.9	(3⁻,4,5⁻)	1318.6[b] 5		2989.67	5⁻
		1506.8[@]		2801.13	5⁻
		1851.9[b] 3		2455.88	3⁻
4335.6	(3,4⁺)	3278.5 4	100	1057.03	2⁺
4348.3		957.6 4	100	3390.70	8⁺

$\gamma(^{88}Zr)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.‡	δ ‡	α	Comments
4348.3		1134.6@		3213.70	(6+)				
4388.34	(7,8+)	997.6 *3*	93 *14*	3390.70	8+				
		1174.7 *5*	100 *11*	3213.70	(6+)				
4413.07	10+	1022.3 *2*	100 *3*	3390.70	8+	E2		6.38×10^{-4}	α(K)=0.000563 *8*; α(L)=6.25×10^{-5} *9*; α(M)=1.083×10^{-5} *16*; α(N)=1.536×10^{-6} *22* α(O)=1.073×10^{-7} *15* B(E2)(W.u.)>15
		1525.14b *20*	1.80 *25*	2887.79	8+	(E2)		3.66×10^{-4}	α(K)=0.000241 *4*; α(L)=2.63×10^{-5} *4*; α(M)=4.56×10^{-6} *7*; α(N)=6.48×10^{-7} *9*; α(O)=4.60×10^{-8} *7* B(E2)(W.u.)>0.037
4461.88	(7,8+)	1071.2@	87 *33*	3390.70	8+				
		1247.8 *5*	44 *13*	3213.70	(6+)				
		1573.9 *3*	100 *13*	2887.79	8+				
		1651.6 *4*	91 *13*	2810.80	6+				
4486.31	(9−)	1002.67 *7*	100 *4*	3483.63	(7−)	(E2)		6.67×10^{-4}	α(K)=0.000588 *9*; α(L)=6.54×10^{-5} *10*; α(M)=1.134×10^{-5} *16*; α(N)=1.607×10^{-6} *23* α(O)=1.121×10^{-7} *16*
		1095.61 *12*	67 *3*	3390.70	8+	(E1)		2.43×10^{-4}	α(K)=0.000215 *3*; α(L)=2.33×10^{-5} *4*; α(M)=4.03×10^{-6} *6*; α(N)=5.73×10^{-7} *8*; α(O)=4.07×10^{-8} *6* I_γ: from ^{74}Ge(^{18}O,4nγ).
4612.29	9+	199.19b *10*	1.9 *5*	4413.07	10+	M1(+E2)	−0.2 *+3−9*	0.03 *3*	α(K)=0.03 *3*; α(L)=0.003 *4*; α(M)=0.0006 *7*; α(N)=8.E−5 *9*; α(O)=6.E−6 *5* B(M1)(W.u.)>0.00025
		1221.70 *14*	100 *3*	3390.70	8+	(M1+E2)	−0.25 *7*	4.50×10^{-4}	α(K)=0.000390 *6*; α(L)=4.26×10^{-5} *6*; α(M)=7.38×10^{-6} *11*; α(N)=1.050×10^{-6} *15*; α(O)=7.52×10^{-8} *11* B(E2)(W.u.)>0.0014; B(M1)(W.u.)>6.1×10^{-5} δ: from $\gamma(\theta)$ ^{86}Sr(α,2nγ). Others: −0.7 *3* from ^{74}Ge(^{18}O,4nγ), −0.3 *2* from ^{89}Y(α,p4nγ).
		1724.49b *20*	4.1 *9*	2887.79	8+	M1(+E2)	+0.05 *8*	3.73×10^{-4}	α(K)=0.000195 *3*; α(L)=2.12×10^{-5} *3*; α(M)=3.68×10^{-6} *6*; α(N)=5.24×10^{-7} *8*; α(O)=3.76×10^{-8} *6* B(M1)(W.u.)>9.7×10^{-7}
4672.7	(3−,4,5)	1871.5 *3*	100	2801.13	5−				
4713.08	10−	100.79 *2*	100.0 *24*	4612.29	9+	E1		0.1110	α(K)=0.0978 *14*; α(L)=0.01106 *16*; α(M)=0.00191 *3*; α(N)=0.000265 *4*; α(O)=1.682×10^{-5} *24* B(E1)(W.u.)=0.000102 *9* δ: δ(M2/E1)=−0.02 *4*.
		226.62 *28*	24.6 *23*	4486.31	(9−)	(M1+E2)	−0.05 *3*	0.0226	α(K)=0.0199 *3*; α(L)=0.00227 *4*; α(M)=0.000395 *7*; α(N)=5.59×10^{-5} *9*; α(O)=3.90×10^{-6} *6* B(E2)(W.u.)=0.008 *+10−8*; B(M1)(W.u.)=0.000142 *18* δ: weighted average of −0.09 *5* from ^{74}Ge(^{18}O,4nγ) and −0.03 *3* from ^{89}Y(α,p4nγ).

$^{88}_{40}Zr_{48}$-8

Adopted Levels, Gammas (continued)

$\gamma(^{88}$Zr) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
4713.08	10⁻	299.90 *13*	9.4 *8*	4413.07	10⁺	E1		0.00486	α(K)=0.00429 *6*; α(L)=0.000475 *7*; α(M)=8.21×10^{-5} *12*; α(N)=1.159×10^{-5} *17*; α(O)=7.92×10^{-7} *12* B(E1)(W.u.)=3.6×10^{-7} *5* δ: δ(M2/E1)=+0.2 *5*.
4797.63	11⁻	84.55 *2*	100.0 *23*	4713.08	10⁻	M1(+E2)	−0.02 *6*	0.325 *12*	α(K)=0.285 *9*; α(L)=0.0333 *19*; α(M)=0.0058 *4*; α(N)=0.00082 *5*; α(O)=5.62×10^{-5} *15* B(M1)(W.u.)=0.48 *5* Mult.: Other: (E1) proposed in ^{89}Y(α,p4nγ).
		384.56 *10*	18.1 *10*	4413.07	10⁺	E1		0.00251	α(K)=0.00221 *4*; α(L)=0.000244 *4*; α(M)=4.22×10^{-5} *6*; α(N)=5.97×10^{-6} *9*; α(O)=4.13×10^{-7} *6* B(E1)(W.u.)=1.44×10^{-5} *15* δ: δ(M2/E1)=−0.03 *4*.
4934.5	(7,8⁺)	546.1 *5*	29 *7*	4388.34	(7,8⁺)	(E2)		0.00323	α(K)=0.00284 *4*; α(L)=0.000328 *5*; α(M)=5.70×10^{-5} *9*; α(N)=8.00×10^{-6} *12*; α(O)=5.33×10^{-7} *8*
		586.1 *5*		4348.3					
		1543.8[@]	100 *12*	3390.70	8⁺				
		1720.8 *4*	84 *10*	3213.70	(6⁺)				
5087.9	(7,8⁺)	2277.1 *3*	100	2810.80	6⁺				
5166.2?	(10,11,12)	368.6[b] *4*	100	4797.63	11⁻				
5229.47	12⁺	816.40 *7*	100.0 *25*	4413.07	10⁺	E2		1.09×10^{-3}	α(K)=0.000962 *14*; α(L)=0.0001081 *16*; α(M)=1.87×10^{-5} *3*; α(N)=2.65×10^{-6} *4*; α(O)=1.83×10^{-7} *3* B(E2)(W.u.)=6.7 *7*
5583.85	12⁻	786.11 *7*	100.0 *9*	4797.63	11⁻	M1(+E2)	0.00 *4*	1.14×10^{-3}	α(K)=0.001003 *14*; α(L)=0.0001104 *16*; α(M)=1.92×10^{-5} *3*; α(N)=2.73×10^{-6} *4*; α(O)=1.94×10^{-7} *3* B(M1)(W.u.)>0.065 δ: Other: −0.3 *1* from $\gamma(\theta)$ in ^{89}Y(α,p4nγ).
5665.91	12⁺	436.49 *7*	100	5229.47	12⁺	M1(+E2)	<0.16	0.00443	α(K)=0.00391 *6*; α(L)=0.000437 *7*; α(M)=7.59×10^{-5} *12*; α(N)=1.078×10^{-5} *17*; α(O)=7.61×10^{-7} *12* B(E2)(W.u.)<1.9×10^{2}; B(M1)(W.u.)>0.59
5787.2	(7,8,9)	2396.5 *5*	100	3390.70	8⁺				
5950.75	(13)⁺	285.19 *20*	3.8 *4*	5665.91	12⁺	M1(+E2)	<0.14	0.01267 *22*	α(K)=0.01116 *20*; α(L)=0.001264 *24*; α(M)=0.000220 *4*; α(N)=3.12×10^{-5} *6*; α(O)=2.18×10^{-6} *4* B(M1)(W.u.)>0.29
		366.5[b] *4*	18 *10*	5583.85	12⁻				

$^{88}_{40}$Zr$_{48}$-9

γ(^{88}Zr) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ‡	α	Comments
5950.75	(13)$^+$	721.21 *14*	100.0 *29*	5229.47	12$^+$	(M1+E2)	−0.10 *6*	1.38×10^{-3}	α(K)=0.001216 *18*; α(L)=0.0001342 *19*; α(M)=2.33×10^{-5} *4*; α(N)=3.31×10^{-6} *5*; α(O)=2.36×10^{-7} *4* B(M1)(W.u.)>0.47 δ: weighted average of −0.07 *4* from ^{74}Ge(^{18}O,4nγ) and −0.20 *7* from ^{89}Y(α,p4nγ).
6000.8?	(13)$^-$	417.0[b] *3*	100	5583.85	12$^-$	M1(+E2)	−0.07 *12*	0.00493 *10*	α(K)=0.00435 *9*; α(L)=0.000487 *11*; α(M)=8.45×10^{-5} *19*; α(N)=1.20×10^{-5} *3*; α(O)=8.47×10^{-7} *16* B(M1)(W.u.)>0.42
6032.52?	(12$^-$)	1234.92[b] *15*	100	4797.63	11$^-$	M1(+E2)	<0.09	4.42×10^{-4}	α(K)=0.000382 *6*; α(L)=4.17×10^{-5} *6*; α(M)=7.22×10^{-6} *11*; α(N)=1.028×10^{-6} *15*; α(O)=7.37×10^{-8} *11*
6192.94	13$^-$	160.42 *3*	15.5 *15*	6032.52?	(12$^-$)	M1(+E2)	−0.08 *8*	0.057 *3*	α(K)=0.0499 *24*; α(L)=0.0058 *4*; α(M)=0.00100 *7*; α(N)=0.000142 *9*; α(O)=9.8×10^{-6} *4* B(E2)(W.u.)=8.E+1 *+16−8*; B(M1)(W.u.)=0.28 *4*
		608.90 *10*	54.5 *30*	5583.85	12$^-$	M1(+E2)	−0.05 *14*	0.00202	α(K)=0.00178 *3*; α(L)=0.000198 *3*; α(M)=3.43×10^{-5} *6*; α(N)=4.88×10^{-6} *8*; α(O)=3.46×10^{-7} *5* B(E2)(W.u.)=0.14 *+76−14*; B(M1)(W.u.)=0.0182 *20*
		1395.39 *7*	100 *5*	4797.63	11$^-$	E2		3.76×10^{-4}	α(K)=0.000288 *4*; α(L)=3.16×10^{-5} *5*; α(M)=5.47×10^{-6} *8*; α(N)=7.77×10^{-7} *11*; α(O)=5.50×10^{-8} *8* B(E2)(W.u.)=1.58 *17*
6238.79	(14)$^+$	288.05 *4*	100.0 *9*	5950.75	(13)$^+$	(M1+E2)	−0.10 *5*	0.01236 *24*	α(K)=0.01088 *21*; α(L)=0.001233 *25*; α(M)=0.000214 *5*; α(N)=3.04×10^{-5} *6*; α(O)=2.13×10^{-6} *4* B(E2)(W.u.)=1.0×10^2 *+11−10*; B(M1)(W.u.)=0.74 *23* δ: from $\gamma(\theta)$ in ^{89}Y(α,p4nγ). Other: <0.11 in ^{74}Ge(^{18}O,4nγ).
		1009.25 *15*	21.7 *11*	5229.47	12$^+$	(E2)		6.57×10^{-4}	α(K)=0.000580 *9*; α(L)=6.44×10^{-5} *9*; α(M)=1.116×10^{-5} *16*; α(N)=1.582×10^{-6} *23* α(O)=1.105×10^{-7} *16* B(E2)(W.u.)=4.1 *13*
6501.32	(14)$^+$	550.6 *3*	100	5950.75	(13)$^+$	M1(+E2)	0.00 *5*	0.00255	α(K)=0.00225 *4*; α(L)=0.000250 *4*; α(M)=4.33×10^{-5} *7*; α(N)=6.16×10^{-6} *9*; α(O)=4.37×10^{-7} *7* B(M1)(W.u.)=0.82 *16*
6578.2		627.5 *5*	100	5950.75	(13)$^+$				
6765.33	(14)$^-$	572.39 *20*	100	6192.94	13$^-$	(M1+E2)	−0.16 *7*	0.00234	α(K)=0.00207 *3*; α(L)=0.000229 *4*; α(M)=3.98×10^{-5} *7*; α(N)=5.66×10^{-6} *9*; α(O)=4.01×10^{-7} *6* B(E2)(W.u.)>3.0; B(M1)(W.u.)>0.23
6826.66	(15)$^+$	325.34 *10*	33.4 *14*	6501.32	(14)$^+$	M1(+E2)	<0.09	0.00906	α(K)=0.00798 *12*; α(L)=0.000899 *13*;

$\gamma(^{88}Zr)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ‡	α	Comments
									α(M)=0.0001562 *23*; α(N)=2.22×10^{-5} *4* α(O)=1.558×10^{-6} *23* B(E2)(W.u.)<1.6×10^{2}; B(M1)(W.u.)>1.3
6826.66	$(15)^+$	587.85 *20*	100 *6*	6238.79	$(14)^+$	M1(+E2)	<0.22	0.00220 *4*	α(K)=0.00194 *3*; α(L)=0.000215 *4*; α(M)=3.74×10^{-5} *6*; α(N)=5.31×10^{-6} *8*; α(O)=3.77×10^{-7} *6* B(E2)(W.u.)<1.5×10^{2}; B(M1)(W.u.)>0.61
7228.2	$(15)^-$	462.87 *20*	100	6765.33	$(14)^-$	M1(+E2)	+0.01 *5*	0.00383	α(K)=0.00338 *5*; α(L)=0.000377 *6*; α(M)=6.55×10^{-5} *10*; α(N)=9.30×10^{-6} *14*; α(O)=6.58×10^{-7} *10* B(M1)(W.u.)>0.28
7431.9		605.2 *3*	100	6826.66	$(15)^+$	D(+Q)	<0.21		
7536.5	(15^-)	771.1 *3*	100 *12*	6765.33	$(14)^-$	M1(+E2)	0.00 *12*	1.19×10^{-3}	α(K)=0.001047 *15*; α(L)=0.0001153 *17*; α(M)=2.00×10^{-5} *3*; α(N)=2.85×10^{-6} *4*; α(O)=2.03×10^{-7} *3* B(M1)(W.u.)>0.15
7878.9	(16^-)	342.2 *4*	100 *19*	7536.5	(15^-)	M1(+E2)	−0.05 *9*	0.00798 *16*	α(K)=0.00703 *14*; α(L)=0.000791 *17*; α(M)=0.000137 *3*; α(N)=1.95×10^{-5} *4*; α(O)=1.373×10^{-6} *25* B(M1)(W.u.)>0.58
		650.9 *4*	86 *19*	7228.2	$(15)^-$	M1(+E2)	−0.14 *+20−40*	0.00174 *6*	α(K)=0.00154 *5*; α(L)=0.000170 *7*; α(M)=2.95×10^{-5} *11*; α(N)=4.19×10^{-6} *15*; α(O)=2.98×10^{-7} *8* B(M1)(W.u.)>0.068
8200.2	(17^-)	321.30 *20*	100	7878.9	(16^-)	M1(+E2)	0.00 *3*	0.00931 *14*	α(K)=0.00820 *12*; α(L)=0.000924 *13*; α(M)=0.0001606 *23*; α(N)=2.28×10^{-5} *4* α(O)=1.603×10^{-6} *23* B(M1)(W.u.)=2.2 *+8−22*
8925.2	(18^-)	724.85 *20*	100	8200.2	(17^-)	M1(+E2)	−0.09 *14*	1.36×10^{-3} *2*	α(K)=0.001202 *18*; α(L)=0.0001326 *20*; α(M)=2.30×10^{-5} *4*; α(N)=3.27×10^{-6} *5*; α(O)=2.33×10^{-7} *4* B(M1)(W.u.)>0.19
9912.6?	(19^-)	987.35[b] *20*	93 *17*	8925.2	(18^-)	M1(+E2)	−0.11 *16*	6.91×10^{-4}	α(K)=0.000611 *9*; α(L)=6.70×10^{-5} *10*; α(M)=1.161×10^{-5} *17*; α(N)=1.653×10^{-6} *24* α(O)=1.181×10^{-7} *17* B(E2)(W.u.)>0.83; B(M1)(W.u.)>0.016
		1712.50[b] *20*	100 *7*	8200.2	(17^-)	E2		3.90×10^{-4}	α(K)=0.000192 *3*; α(L)=2.09×10^{-5} *3*; α(M)=3.63×10^{-6} *5*; α(N)=5.16×10^{-7} *8*; α(O)=3.67×10^{-8} *6* B(E2)(W.u.)<1.2
10557.3?	(20)	644.7[b] *7*	100	9912.6?	(19^-)	D(+Q)	<0.25		

From ENSDF

$^{88}_{40}Zr_{48}$-11

Adopted Levels, Gammas (continued)

$\gamma(^{88}Zr)$ (continued)

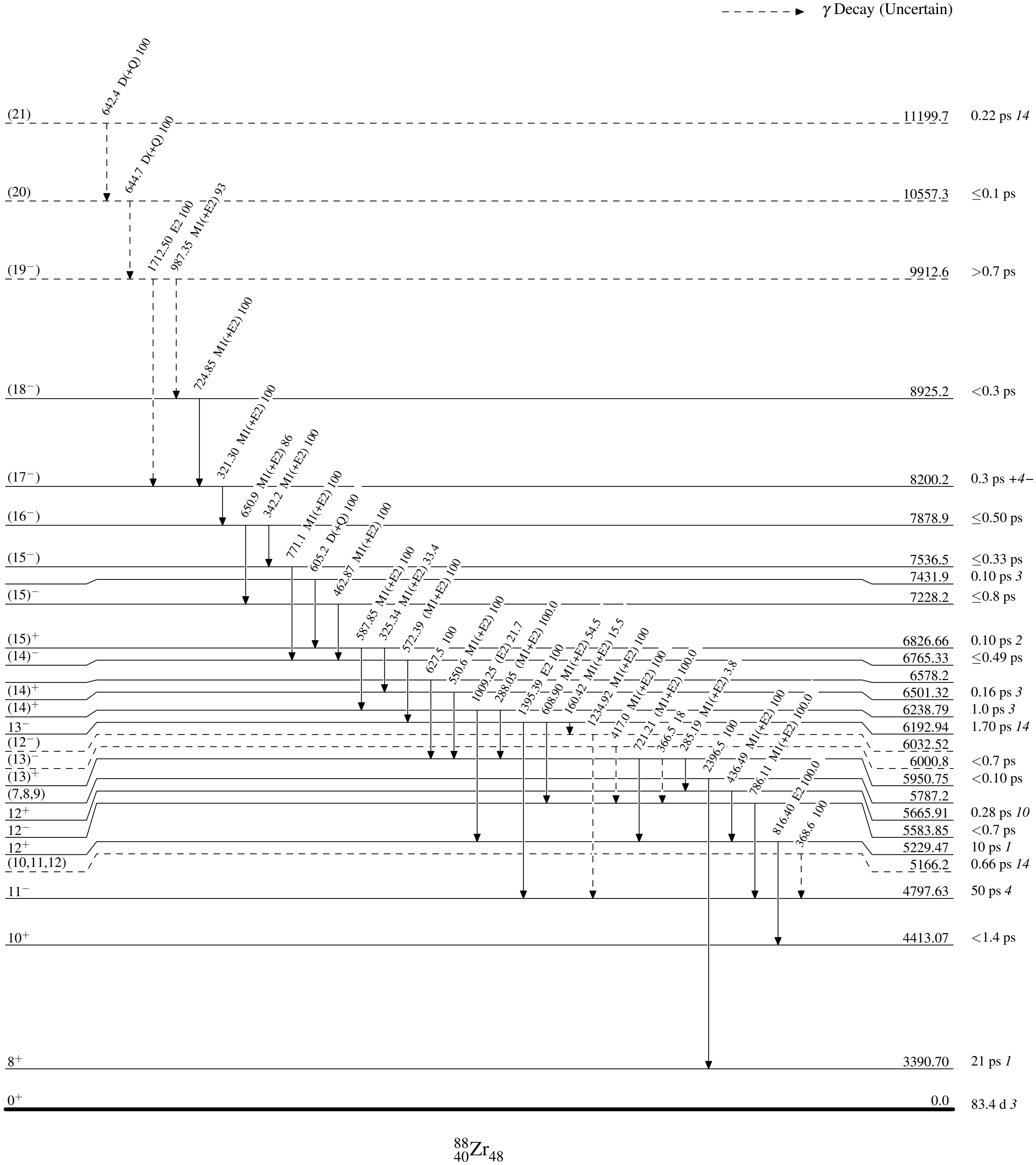
E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
11199.7?	(21)	642.4[b] *7*	100	10557.3?	(20)	D(+Q)	−0.3 *+4−9*	0.00184 *6*	α(K)=0.00160 *11*; α(L)=0.00018 *1*

[†] Weighted averages of all decay and reaction data.
[‡] From $\gamma(\theta)$ and linear polarization in ^{74}Ge(^{18}O,4nγ), except where noted.
[#] Total I(γ+ce) branching ratio from ^{89}Y(p,2nγ).
[@] From level-energy difference.
[&] Multiply placed.
[a] Multiply placed with undivided intensity.
[b] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



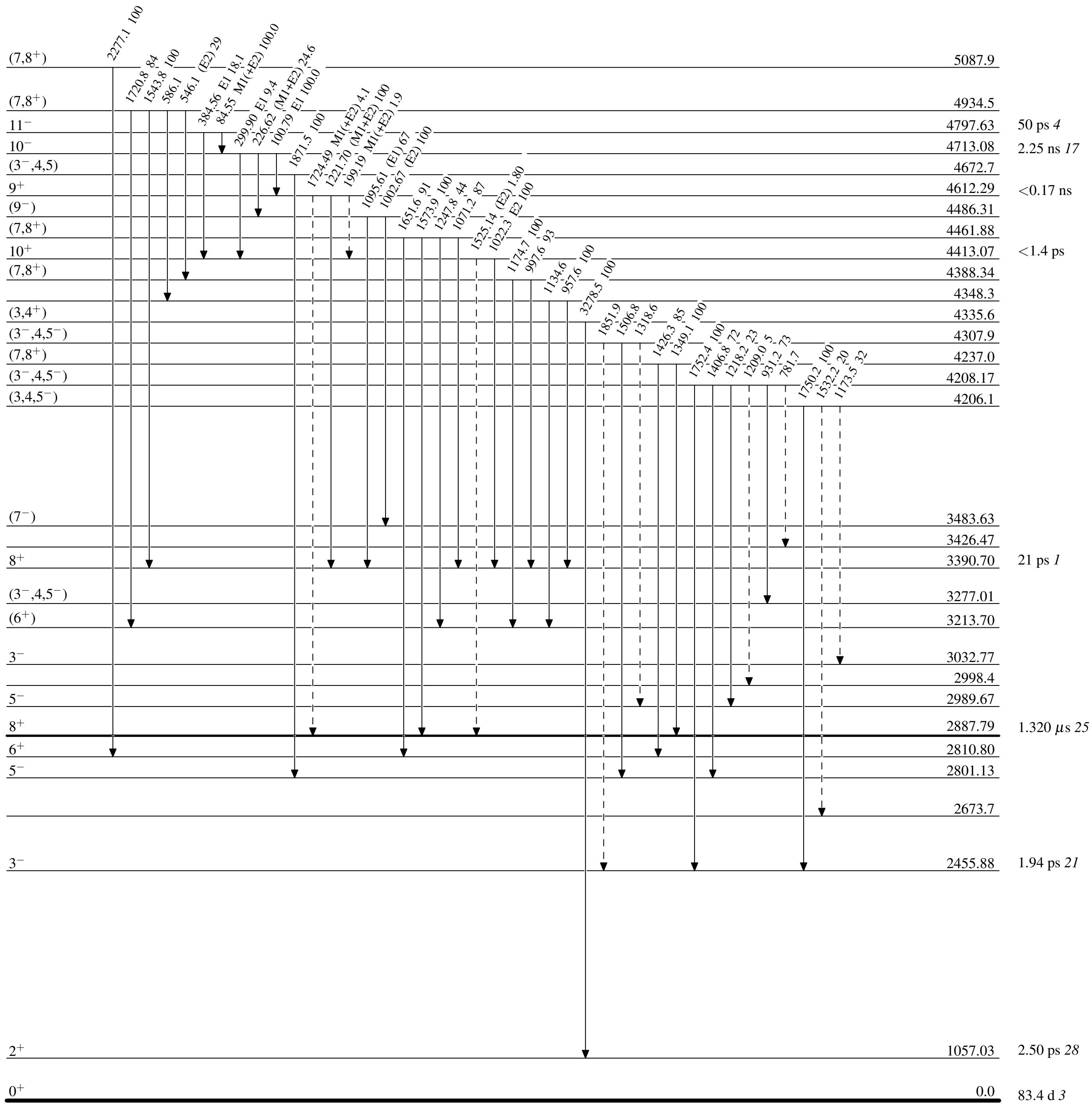
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



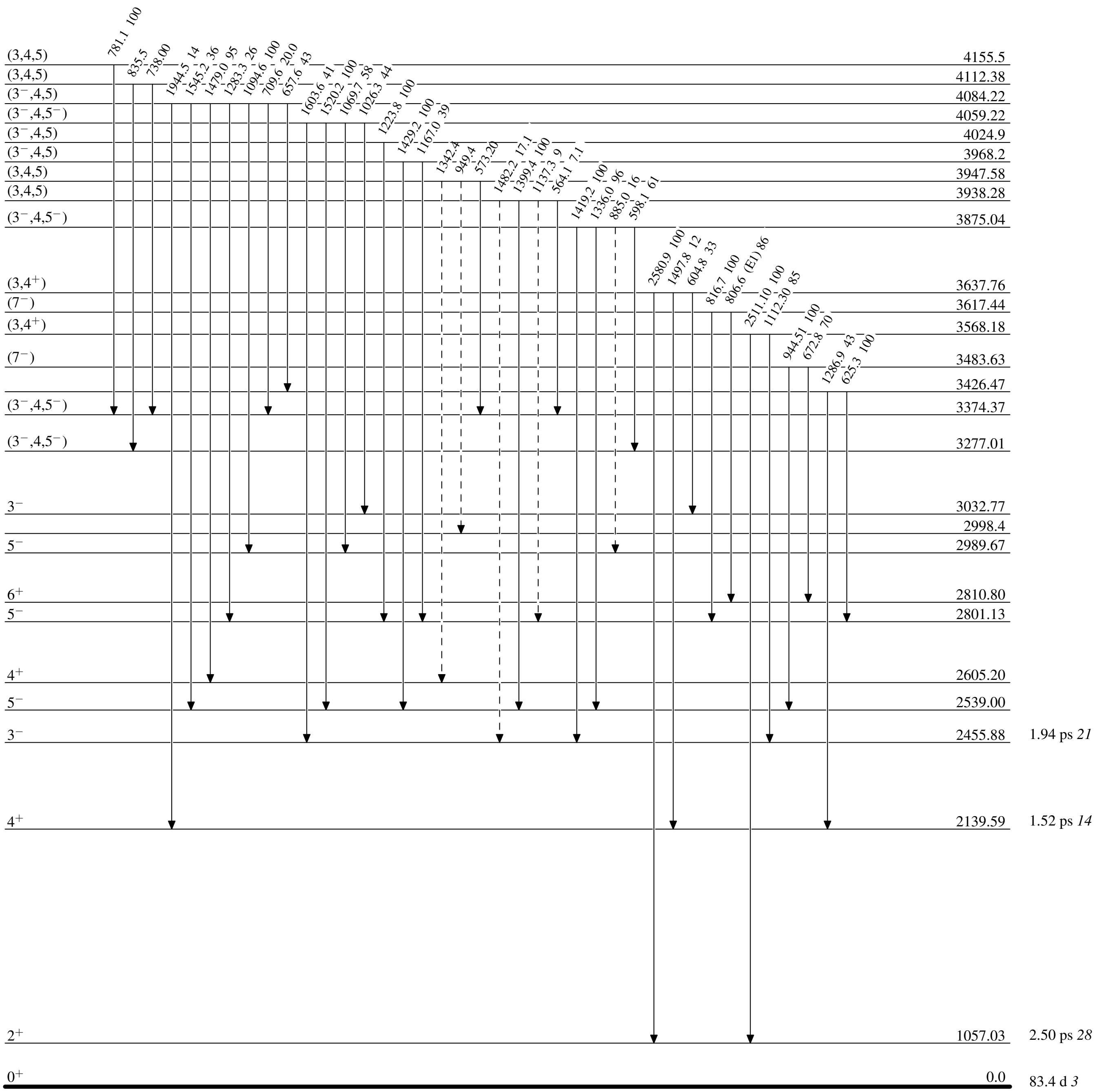
$^{88}_{40}Zr_{48}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend



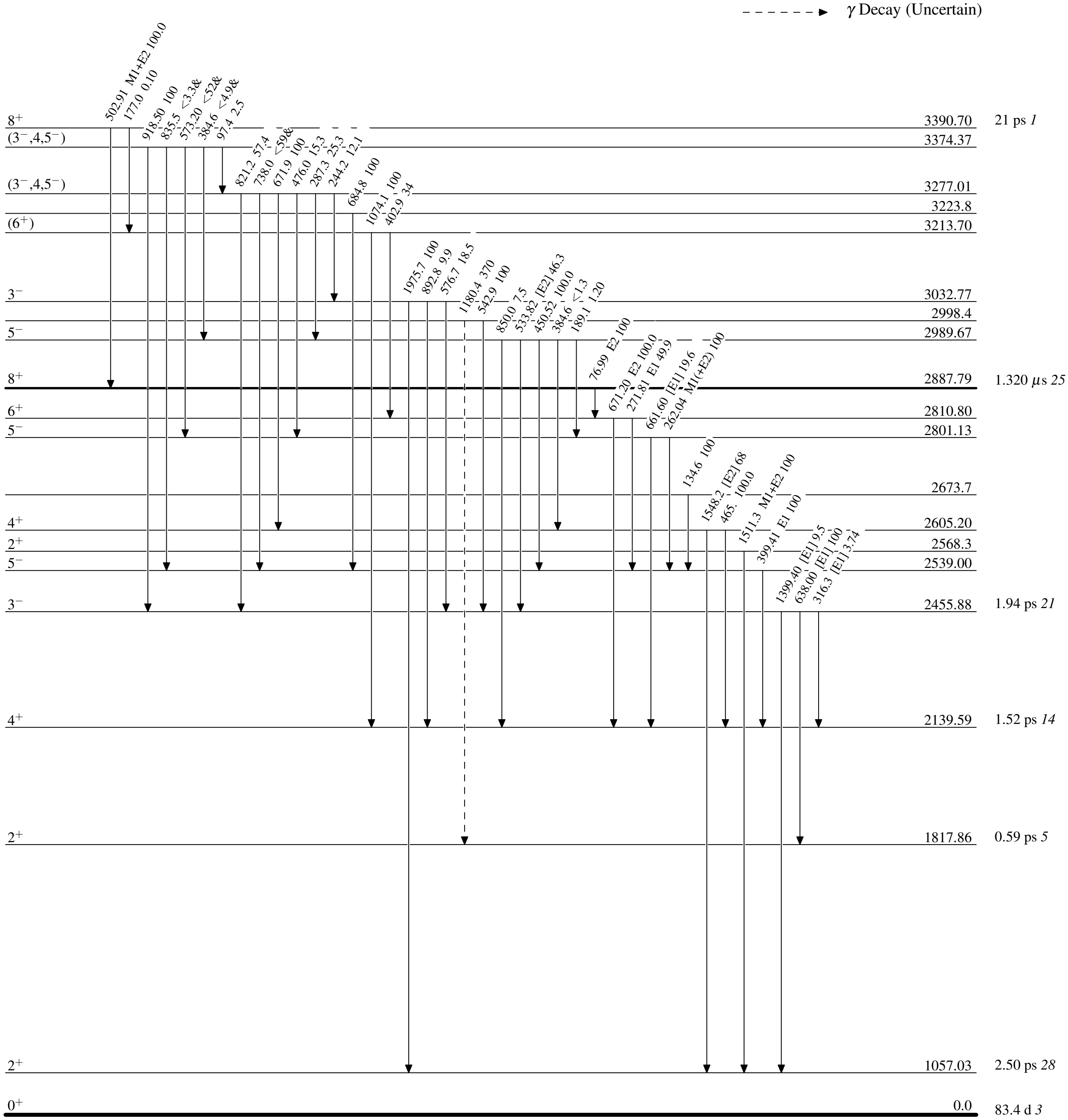
$^{88}_{40}Zr_{48}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

Legend

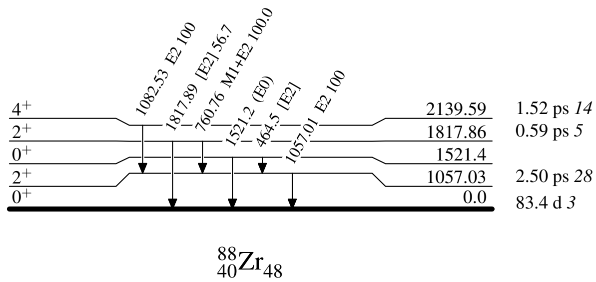


$^{88}_{40}Zr_{48}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



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^-)=−6111 *3*; S(n)=11968 *3*; S(p)=8353.2 *16*; Q(α)=−6674.3 *612* 2017Wa10
S(2n)=21286 *5*; S(2p)=15428.86 *12* (2017Wa10).
α: Additional information 1.

^{90}Zr Levels

Cross Reference (XREF) Flags

A	^{90}Y β^- decay (64.00 h)	N	^{90}Zr(α,α')	Others:	
B	^{90}Y β^- decay (3.19 h)	O	^{91}Zr(^{3}He,α)	AA	^{90}Zr(e,e$'$)
C	^{90}Nb ε decay	P	^{89}Y(p,γ)	AB	^{92}Zr(p,t)
D	^{90}Zr IT decay (809.2 ms)	Q	^{90}Zr(e,e$'$p),(γ,p)	AC	^{91}Zr(d,t)
E	^{76}Ge(^{18}O,4nγ)	R	^{90}Zr(γ,n)	AD	^{88}Sr(^{3}He,n)
F	^{87}Sr(α,nγ)	S	^{89}Y(p,n),(p,nγ)	AE	^{88}Sr(^{16}O,^{14}C),(^{12}C,^{10}Be)
G	^{89}Y(^{3}He,d)	T	^{89}Y(p,p),(pol p,p)	AF	^{90}Zr(n,n$'$)
H	^{90}Zr(t,t$'$)	U	^{89}Y(p,p$'$),(p,p$'\gamma$)	AG	^{92}Zr(α,^{6}He)
I	^{91}Zr(p,d)	V	^{90}Zr(p,p$'$)	AH	^{94}Mo(d,^{6}Li)
J	^{90}Zr(^{3}He,dp)	W	^{90}Zr(p,p$'\gamma$)	AI	^{92}Mo(^{14}C,^{16}O)
K	^{89}Y(d,n)	X	^{90}Zr(n,n$'\gamma$)	AJ	Coulomb excitation
L	^{90}Zr(d,d$'$)	Y	^{93}Nb(p,α)	AK	^{90}Zr(^{17}O,^{17}O$'$),(^{17}O,^{17}O$'\gamma$)
M	^{90}Zr(^{3}He,^{3}He$'$)	Z	^{90}Zr(γ,γ')	AL	^{208}Pb(^{90}Zr,^{90}Zr$'\gamma$)

E(level)†	J$^\pi$	T$_{1/2}$‡	XREF	Comments
0	0$^+$	stable	ABCDEFGHIJKLMNOP VWXYZ	XREF: Others: AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK
1760.74 *14*	0$^+$	61.3 ns *25*	A CDE GH KL P VWXY	XREF: Others: AB, AC, AD, AF, AH, AI, AK, AL T$_{1/2}$: from delayed coincidence in ^{90}Zr(p,p$'$e). Other: 62 ns *4* (1959Kl46). J$^\pi$: E0 1760.7 transition to 0$^+$.
2186.273 *14*	2$^+$	87.9 fs *21*	A CDEF HIJ LMNOP VWXYZ	XREF: Others: AA, AB, AE, AF, AG, AH, AI, AJ, AK, AL μ=2.5 *4* T$_{1/2}$: from DSA measurements following projectile Coulomb excitation using ^{90}Zr (2000Ja11). Others: 87.0 fs *28* from (e,e$'$) Coulomb excitation (1984He02), 93 fs *5* from nuclear resonance fluorescence (1972Me04), 82 fs *+16−12* from Doppler-Shift Attenuation in ^{89}Y(p,γ) (1993Sa38) and 86.6 fs *+49−42* from ^{90}Zr(n,n$'\gamma$) (2013Pe16). μ: from Transient Field Integral Perturbed Angular Correlation (2000Ja11,2014StZZ). J$^\pi$: E2 2186γ to 0$^+$.
2319.000 *9*	5$^-$	809.2 ms *20*	BCDEFGH KL N P VWXY	XREF: Others: AB, AE, AG, AH, AK, AL %IT=100 μ=6.25 *13* T$_{1/2}$: from (n,n$'\gamma$). μ: From Nuclear Magnetic Resonance on Oriented Nuclei (1987Ed02,1987Ra17,2014StZZ). J$^\pi$: E5 2319.0γ to 0$^+$.
2739.29 *5*	(4)$^-$		C EFG I K M O	XREF: Others: AK, AL J$^\pi$: 2252.9γ from 2$^-$, 420.3γ to 5$^-$.
2747.875 *16*	3$^-$	15.2 ps *28*	C EF H J L N P VWX	XREF: Others: AB, AE, AG, AH, AI, AK, AL

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)†	J$^\pi$	T$_{1/2}$‡	XREF	Comments
				μ=3.0 *2* μ: From Nuclear Magnetic Resonance on Oriented Nuclei (2000Ja11,2014StZZ). J$^\pi$: E3 2747.5γ to 0$^+$.
3076.925 *15*	4$^+$		C EF HI L NOP VWXY	XREF: Others: AA, AE, AF, AH, AK, AL J$^\pi$: E2 890.6γ to 2$^+$.
3308.10 *8*	2$^+$	67.9 fs *+42−35*	F HI L NOP VWXYZ	XREF: Others: AA, AE, AF, AG, AH, AK, AL T$_{1/2}$: from measurement with metallic sample in (n,n′γ) (2013Pe16). Others: 69 fs *13* from Coul. ex. in (e,e′) (1984He02), 72 fs *21* from nuclear resonance fluorescence (1974Me13), 96 fs *+6−5* from Doppler-Shift Attenuation in ^{89}Y(p,γ) (1993Sa38), and 97 fs *14* from Doppler-Shift Attenuation in ^{90}Zr(n,n′γ) (1993BeZL). J$^\pi$: E2 3308.1γ to 0$^+$.
3448.230 *14*	6$^+$	>1.46 ps	C EF H L N V XY	XREF: Others: AA, AH, AK, AL J$^\pi$: E2 371.3γ to 4$^+$.
3557 *5*			I	E(level): From ^{91}Zr(p,d).
3589.418 *15*	8$^+$	131 ns *4*	C EF H V XY	XREF: Others: AA, AH, AL Q=−0.51 *3*; μ=+10.84 *6* T$_{1/2}$: weighted average of 125 ns *6* from delayed coincidence in ^{90}Nb ε decay (1964Lo02) and 134 ns *4* from γ(t) (1977Ha49). Q: from time-differential Perturbed Angular Distribution (1977Ha49,1989Ra17,2014StZZ). μ: from time-differential Perturbed Angular Distribution, corrected for diamagnetic shift and Knight shift (1985Ra09,1989Ra17,2014StZZ). J$^\pi$: E2 141.2γ to 6$^+$.
3842.34 *11*	2$^+$	15.1 fs *12*	HI LMNOP VWXYZ	XREF: Others: AA, AG, AH, AL T$_{1/2}$: weighted average of 15.1 fs *9* from Coul. ex. in (e,e′) (1984He02), 19.0 fs *27* from nuclear resonance fluorescence, $\Gamma_{\gamma0}/\Gamma_\gamma$=1 was assumed, 14 fs *+6−4* from Doppler-Shift Attenuation in ^{89}Y(p,γ) (1993Sa38), 10 fs *3* from Doppler-Shift Attenuation in 90Zr(n,n′γ) (1993BeZL) and 24 fs *5* from DSA measurements in (n,n′γ) (2003Ga23). J$^\pi$: E2 3842γ to 0$^+$.
3932.4 *6*			Z	
3958.59 *10*	5$^-$	33 fs *6*	H L N V XY	XREF: Others: AA, AH J$^\pi$: from DWBA analysis of $\sigma(\theta)$ in (e,e′), L(p,p′)=5.
4058.07 *9*	4$^+$	0.12 ps *+6−4*	H V X	XREF: Others: AA, AL
4124.49 *14*	0$^+$		N P V XY	XREF: Others: AB, AG, AH J$^\pi$: from L(p,p′)=0, L(p,t)=0.
4223& *2*	(2)$^+$		HI L Y	XREF: Others: AA, AK J$^\pi$: from L(d,d′)=2.
4225.35 *12*	(4$^-$)	20 fs *5*	K N X	XREF: Others: AA J$^\pi$: (M1+E2) 1905.5γ to 5$^-$, 1478.0γ to 3$^-$.
4229.05 *9*	2$^+$	27 fs *3*	G X	XREF: Others: AA, AG J$^\pi$: E2 4229.3γ to 0$^+$.
4232.220 *24*	(6$^-$)	45 fs *+37−19*	C P V X	XREF: Others: AB J$^\pi$: (M1+E2) 1913.19γ to 5$^-$, feeding from 8$^+$ parent in ^{90}Nb ε decay.

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
4236.96 *10*	(1,2+)	104 fs *21*	WX	Jπ: 2476.2γ to 0+.
4262.37 *8*	(3+)	0.28 ps *+13−7*	X	Jπ: (M1+E2) 1185.6γ to 4+, (M1+E2) 2076.2γ to 2+.
4299.12 *11*	(5−)	31 fs *6*	X	Jπ: (M1+E2) 1908.1γ to 5−, (M1+E2) 1559.9γ to (4)−.
4305[@] *6*	4+		N V	Jπ: from L(α,α′)=4.
4319.2? *3*			C HI Y	XREF: Others: AH
4331.93 *9*	4+	37 fs *6*	NO V X	XREF: Others: AA, AB, AG Jπ: from L(p,t)=4. Suggested to be the 4+ member of the configuration=((ν $1g_{9/2}$)$^{-1}$(ν $d_{5/2}$)) multiplet.
4348.10 *13*	(4+)	29 fs *7*	LM X	Jπ: shape of excitation function consistent with J=4 in (n,n′γ), 2161.9γ to 2+.
4375.07 *6*	7−		C H N V XY	XREF: Others: AL Jπ: from L(α,α′)=7.
4426.43 *13*	0+	0.20 ps *+24−8*	K P V XY	XREF: Others: AB, AH Jπ: from L(p,t)=0.
4454.71 *10*	(5+)		HI O XY	XREF: Others: AA Jπ: shape of excitation function in (n,n′γ) consistent with J=4 or 5; L(^{3}He,α)=(4) and suggested to be the 5+ member of the configuration=((ν $1g_{9/2}$)$^{-1}$(ν $d_{5/2}$)) multiplet.
4455.58 *10*	(2)	0.14 ps *+5−3*	V XY	Jπ: D+Q 1707.9γ to 3−.
4474.31 *14*	4+	0.15 ps *+18−6*	N V XY	XREF: Others: AA Jπ: from comparison of DWBA calculations to σ(θ) in (e,e′).
4494.79 *12*	(3−)	42 fs *8*	V X	Jπ: D+Q 1755.5γ to (4)−, 1747.2γ to 3−, L(p,p′)=(3).
4500[f] *15*	0+,1+,2+		G	Jπ: from L(^{3}He,d)=1.
4507.0 *8*			Z	
4533.52 *10*	(3−)	69 fs *+35−28*	HI X	Jπ: (M1+E2) 1794.2γ to (4)−, 2347.3γ to 2+.
4537.70 *11*	(4−)	0.13 ps *+7−5*	K XY	XREF: Others: AG, AH Jπ: (M1+E2) 2218.7γ to 5−.
4541.37 *3*	6+	59 fs *+17−12*	C NO V X	XREF: Others: AA, AB Jπ: from L(p,t)=6; suggested to be the 6+ member of the configuration=((ν $1g_{9/2}$)$^{-1}$(ν $d_{5/2}$)) multiplet.
4562.02 *14*	5	0.14 ps *+10−4*	G I X	XREF: Others: AA Jπ: shape of excitation function in (n,n′γ) consistent with J=5.
4578.93 *13*	(1)	5.1 fs *20*	P X Z	$T_{1/2}$: other=8.7 fs *+13−9* from DSA in ^{89}Y(p,γ). Jπ: population in (γ,γ′).
4591.37 *10*	(3+)	0.14 ps *+4−3*	H O V X	Jπ: shape of excitation function in (n,n′γ) consistent with J=5;ssuggested to be the 3+ member of the configuration=((ν $1g_{9/2}$)$^{-1}$(ν $d_{5/2}$)) multiplet in (^{3}He,α).
4614.42 *13*	(6+)		X	Jπ: shape of excitation function in (n,n′γ) consistent with J=6, 1537.6γ to 4+.
4640.94 *4*	7,8		C X	Jπ: feeding from 8+ parent in ^{90}Nb beta decay, 1192.7γ to 6+.
4646.7 *3*	1,2+	5 fs *4*	GHI P V X	XREF: Others: AG, AH Jπ: 4646.6γ to 0+.
4681.26 *12*	2+	31 fs *7*	NOP V X	XREF: Others: AA, AB, AK

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)†	J^π	$T_{1/2}$‡	XREF	Comments
				J^π: E2 4680.8γ to 0^+; suggested to be the 2^+ member of the configuration=$((\nu\ 1g_{9/2})^{-1}(\nu\ d_{5/2}))$ multiplet in (^{3}He,d).
4701.10 *10*	2^+	46 fs *7*	X	J^π: E2 2940.6γ to 0^+.
4710@ *6*			V	E(level): possibly the same as the 4701 level. L(p,p′)=2 would be consistent with J^π of 4701 level.
4774.29 *13*			G X	
4781.81 *20*	4,(3^-)	14 fs *+22−13*	V X	J^π: shape of excitation function in (n,n′γ) consistent with J=3 or 4; 2462.8γ to 5^-.
4795.6 *3*	2^+	7 fs *+6−3*	HI X	XREF: Others: AH J^π: E2 4795.5γ to 0^+.
4814.44 *11*	(3^-)		X	XREF: Others: AB J^π: from L(p,t)=3, assuming the 4814 level corresponds to that observed in (p,t).
4818.02 *12*	(3,4^+)	0.14 ps *+19−7*	N X	XREF: Others: AB, AG J^π: shape of excitation function in (n,n′γ) consistent with J=3 or 4, 975.8γ to 2^+.
4824.21 *13*	2^+	40 fs *+10−8*	V X	J^π: L(p,t)=2; 1747.2γ to 4^+, 4823.9γ to 0^+.
4840.27 *14*	5^-	83 fs *+28−14*	X	J^π: shape of excitation function in (n,n′γ) consistent with J=5, 2092.7γ to 3^-.
4849@ *6*			V	
4867.47 *12*	5^+	0.14 ps *+5−4*	X	J^π: shape of excitation function in (n,n′γ) consistent with J=5, M1+E2 1790.7γ to 4^+.
4875@ *6*			V	
4932.6 *4*	1,2^+	0.18 ps *+35−11*	X	J^π: 4932.5γ to 0^+.
4941.89 *13*	(4^+)	49 fs *10*	N V X	J^π: from L(α,α′)=4.
4992.36 *12*		0.21 ps *+13−6*	G I P V X	
5059.975 *21*	7^+		C I NO V X	XREF: Others: AA, AB J^π: E3 2741γ to 5^-, E1 827.7γ to 6^-; suggested to be the 7^+ member of the configuration=$((\nu\ 1g_{9/2})^{-1}(\nu\ d_{5/2}))$ multiplet in (^{3}He,α).
5068.6 *6*	1,2^+	7 fs *+13−6*	X	J^π: 5068.4γ to 0^+.
5084.03 *14*	2,3	46 fs *+12−10*	G K V X	XREF: Others: AA J^π: shape of excitation function in (n,n′γ) consistent with J=2 or 3.
5090.30 *23*	(3^-)		G I P XY	J^π: shape of excitation function in (n,n′γ) consistent with J=3.
5107.92 *21*	(3),4^+	0.07 ps *+4−3*	H P X	XREF: Others: AB, AG J^π: 2368.6γ to $(4)^-$, 2921.7γ to 2^+.
5112.6 *14*	3^-		N V X	J^π: from L(α,α′)=3.
5164.484 *23*	$(8)^+$		C E	J^π: (E2) 1717.3γ to 6^+, M1,E2 1575.0γ to 8^+.
5171.90 *16*	(4)	23 fs *+8−6*	X	J^π: shape of excitation function in (n,n′γ) consistent with J=4.
5175.8 *3*	3,4^+	22 fs *+21−8*	G V X Z	J^π: shape of excitation function in (n,n′γ) consistent with J=3 or 4, 2989.5γ to 2^+.
5183.61 *18*	1,2^+	6.9 fs *35*	P X Z	J^π: 5183.2γ to 0^+.
5222.97 *23*	(4^+)		H N V X	J^π: from L(p,p′)=4.
5232.3 *3*		34.0 fs *28*	X	
5247.52 *4*	9^+	<28[g] ps	C E	J^π: E2(+M1) 1658.1γ to 8^+.
5270.74 *20*		17 fs *+53−16*	X	
5275.4 *10*	(2^+)	0.80[h] ps *+20−11*	P	J^π: 5275γ (E2) to 0^+.
5305.97 *20*	2^+	17 fs *5*	X Z	J^π: E2 5305.8γ to 0^+.

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
5307.75 *15*	$(3^-,4^+)$	0.07 ps *+8−2*	G P X	J^π: 2988.9γ to 5^-, 3121.3γ to 2^+.
5312.77 *20*	$1,2^+$	59 fs *10*	N V X	XREF: Others: AB J^π: 5312.6γ to 0^+.
5317.7 *3*	3^-	0.19 ps *+11−6*	O X	XREF: Others: AB, AH J^π: from L(p,t)=3.
5359.22 *19*	3,4	22.9 fs *28*	X	J^π: shape of excitation function in (n,n′γ) consistent with J=3 or 4.
5379.8 *3*	(4^+)	20 fs *4*	H N V X	J^π: from L(p,p′)=L(α,α')=4.
5426.01 *13*	3^-	52 fs *+19−14*	C G I X	XREF: Others: AH J^π: E2 3106.8γ to 5^-, 2118.1γ to 2^+.
5432.790 *22*	$7^+,8^+$		C	J^π: feeding from 8^+ parent in ^{90}Nb ε decay, M1,E2 1843.3γ to 8^+, 1984.5γ to 6^+.
5437.33 *13*	2^+	24.3 fs *35*	V X	XREF: Others: AG XREF: V(5433). J^π: from L(p,p′)=2, E2 5436.9γ to 0^+.
5441[#] *5*	0^+			XREF: Others: AB J^π: from L(p,t)=0.
5457.70 *18*	(4^+)	115.9 fs *28*	H N V X	XREF: N(5464)V(5462). J^π: from L(t,t′)=4.
5504.75 *19*		7.7 fs *7*	I N VWX Z	
5513.41 *16*	(3,4)	0.16 ps *+8−6*	X	XREF: Others: AB XREF: AB(5507). J^π: from L(p,t)=3,4.
5564.2 *4*		7.6 fs *28*	I X	XREF: Others: AH
5582[@] *6*	(3^-)		N V	J^π: from L(α,α')=(3).
5590.58 *14*	2^+	15.9 fs *21*	X	XREF: Others: AB J^π: from L(p,t)=2.
5601.8 *4*		24 fs *4*	X	
5607.6 *4*		14 fs *+9−7*	G MN X	XREF: Others: AA
5631[@] *7*	3^-		I K V	B(E3)↑=0.0068 *10* (1975Si21) J^π: from (e,e′).
5644.02 *4*	10^+	<28[g] ps	E H	XREF: Others: AH, AL J^π: E2 2054.6γ to 8^+.
5651.1 *3*		45 fs *5*	G X	
5666[@] *7*	3^-		NO V	J^π: from L(α,α')=3.
5703[@] *7*			V	
5724.3 *4*		22 fs *4*	X	
5753[@] *7*			G K V	XREF: Others: AA
5775.1 *5*		24 fs *+21−6*	H N X	
5781[@] *7*	3^-		V	XREF: Others: AA B(E3)↑=0.00145 *22* (1975Si21) J^π: from (e,e′), L(p,p′)=3.
5785.0 *4*			Z	
5792.05 *3*	(9^+)		E	J^π: (M1+E2) 2202.6γ to 8^+.
5808 *4*			O Z	
5821.8 *6*			X	
5829[@] *7*			V	
5846.4 *5*		14 fs *+44−13*	G K X	
5884.4 *4*			N VW Z	
5938[#] *5*			HI N V	XREF: Others: AB, AH J^π: L(p,p′)=3 and L(p,t)=(1) are in conflict.
5977[@] *7*			V	
6006[@] *7*			V	

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J^{π}	$T_{1/2}$[‡]	XREF	Comments
6020[f] 15	$1^-,2^-,3^-$		G K	J^{π}: L(^{3}He,d)=L(d,n)=2.
6058[@] 7			V	
6070[f] 15	$1^-,2^-,3^-$		GH V	J^{π}: L(^{3}He,d)=2.
6106[@] 7			V	
6128[@] 7			V	
6167[@] 7			V	
6200[f] 15	$1^-,2^-,3^-$		G K V	J^{π}: L(^{3}He,d)=2.
6229[@] 7			V	
6250[f] 15	$1^-,2^-,3^-$		G K V	J^{π}: L(^{3}He,d)=L(d,n)=2.
6279.70 8	11^+		E	J^{π}: E2 1032.2γ to 9^+.
6290[@]			V	
6296 3	1^-		H O Z	
6308[@] 7			V	
6320[f] 15	$1^-,2^-,3^-$		G	J^{π}: L(^{3}He,d)=2.
6370[f] 15			G	
6376.10 5	(10^-)	<28[g] ps	E	J^{π}: E1(+M2) 818.2γ from (11^+).
6389.8 3	1		Z	J^{π}: D 6389.6γ to 0^+.
6397[@] 7			G VW	
6424.3 3	1^-[i]		H V Z	XREF: Others: AK
6479[@]			V	
6496[@] 7			V	
6517[@]			V	
6547[@] 7			H V	
6565.7 3	1		Z	J^{π}: D 6565.4γ to 0^+.
6574[@] 7			V	E(level): Unresolved doublet.
6640.1 10	(2^+)	21[h] fs +7−6	G P V	J^{π}: (E2) 6640γ to 0^+.
6669.2 7	1		G K Z	J^{π}: D 6668.9γ to 0^+.
6694[@]			V	
6710[f] 15			G V	
6721.11 5	(10^-)		E	J^{π}: 1473.7γ to 9^+.
6742[@]			G V	XREF: Others: AH
6761.4 2	1^-[i]		Z	
6769.51 14	(12^+)		E	J^{π}: (M1+E2) 489.8γ to (11^+).
6794[@] 7			V	
6810[f] 15	$1^-,2^-,3^-$		G K V	J^{π}: L(^{3}He,d)=2.
6853[@]			V	
6867[@]			V	
6876 3	1^-[i]		G Z	
6895[@]			V	
6924[@] 8			V	
6953.94 6	$(11)^-$	<28[g] ps	E	J^{π}: E1(+M2) 1309.8γ to 10^+.
6960.4 7	1		Z	J^{π}: D 6960.1γ to 0^+.
6974[@]			V	
7000[f] 15	$0^-,1^-$		G K V	J^{π}: L(^{3}He,d)=0.
7008.63 6	(11^-)		E	J^{π}: (E1(+(M2)) 1364.7γ to 10^+.
7025.59 4	(10^+)		E	J^{π}: (E2) 1861.4γ to $(8)^+$.
7042.0 7	1		Z	J^{π}: D 7041.7γ to 0^+.

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
7047[@]			V	
7060[@]			V	
7085.6 *10*	(1)		Z	J^π: (D) 7085.3γ to 0^+.
7089[@]			V	
7110[f] *15*	$0^-,1^-$		G K	J^π: from L(^{3}He,d)=0.
7120[@]			V	
7136[@] *8*			V	
7151[@]			V	
7160[f] *15*	$1^-,2^-,3^-$		G V	J^π: from L(^{3}He,d)=2.
7194.35 *4*	(11^+)	<28 ps	E	J^π: M1+E2 168.8γ to (10^+).
7198.2 *6*	1		Z	J^π: D 7197.9γ to 0^+.
7200[@]			V	
7223.89 *6*	$(12)^+$	59 ps *10*	E	J^π: E1(+M2) 269.9γ to $(11)^-$.
7235[@]			V	
7250 *3*	1^-[i]		G K Z	
7263[@]			V	
7275[@]			V	
7280.9 *7*			Z	
7350[f] *15*	$1^-,2^-,3^-$		G V	J^π: from L(^{3}He,d)=2.
7361.0 *6*	1		Z	J^π: D 7360.8γ to 0^+.
7378[@] *8*			V	
7387.6 *4*	1		Z	J^π: D 7387.3γ to 0^+.
7402[@]			V	
7420[f] *15*			G V	
7424.5 *10*			Z	
7433.8 *8*	1		Z	J^π: D 7433.5γ to 0^+.
7437.82 *7*	$(13)^+$	2.9[g] ps *5*	E	J^π: M1+E2 213.9γ to $(12)^+$.
7461[@]			V	
7468 *2*			Z	
7474.9 *3*	(1)		Z	J^π: (D) 7474.6γ to 0^+.
7480[f] *15*			G K	
7530[f] *15*			G V	
7580[f] *15*			G	
7614[@]			V	
7633[@]			V	
7649.9 *10*	(2^+)	0.55[h] ps *+9−7*	P	J^π: (E2) 7650γ to 0^+.
7650[f] *15*	$1^-,2^-,3^-$		G	J^π: from L(^{3}He,d)=2.
7685.8 *4*	1		Z	J^π: D 7685.4γ to 0^+.
7702.9 *3*	1^-[i]		Z	
7723.1 *9*			V Z	
7750[@]			V	
7759.7 *6*	(1)		Z	J^π: (D) 7759.3γ to 0^+.
7767[@]			G V	
7774[&] *10*			K	XREF: Others: AA
7779.0 *6*	1		Z	J^π: D 7778.6γ to 0^+.
7796[@]			V	
7806[&] *10*	(2^-)			XREF: Others: AA

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
				J^π: from (e,e′).
7807.9 *3*	1		Z	J^π: D 7807.5γ to 0^+.
7840[f] *15*	$1^-,2^-,3^-$		G K	J^π: from L(^{3}He,d)=2.
7857.8 *7*	(1)		Z	J^π: (D) 7857.4γ to 0^+.
7868[&] *10*	$(1^+,2^-)$			XREF: Others: AA J^π: from (e,e′).
7877[@]			V	
7907[&] *10*			G V	XREF: Others: AA
7926[@]			V	
7935.6 *3*	1		Z	J^π: D 7935.2γ to 0^+.
7976.6 *4*	1		Z	J^π: D 7976.2γ to 0^+.
7984[@]			V	
7996[&] *10*	(3^-)		G K	XREF: Others: AA J^π: from (e,e′).
8006.9 *8*	1		Z	J^π: D 8006.5γ to 0^+.
8032[&] *10*	2^-		G	XREF: Others: AA J^π: from (e,e′).
8058.41 *8*	$(14)^+$	0.28[g] ps *14*	E	J^π: M1+E2 620.6γ to $(13)^+$.
8067.4 *5*	(1)		Z	J^π: (D) 8067.0γ to 0^+.
8110 *3*	1^-[i]		Z	XREF: Others: AA
8120[f] *15*			G V	
8131 *3*	(1^-)		Z	XREF: Others: AA J^π: (E1) 8131.5γ to 0^+.
8144 *2*			Z	
8166.7 *5*	(1)		V Z	J^π: (D) 8166.3γ to 0^+.
8221.2 *8*	1		Z	J^π: D 8220.8γ to 0^+.
8235.6 *3*	1		Z	J^π: D 8235.2γ to 0^+.
8250.7 *5*	1		Z	J^π: D 8250.3γ to 0^+.
8276[@]			V	
8291[&] *10*	2^-			XREF: Others: AA J^π: from (e,e′).
8295.3 *10*	(1)		Z	J^π: (D) 8294.9γ to 0^+.
8313.0 *7*	1		Z	J^π: D 8312.6γ to 0^+.
8316[&] *10*	(2^-)			XREF: Others: AA J^π: from (e,e′).
8334.1 *5*	1		Z	J^π: D 8333.7γ to 0^+.
8357.5 *18*	1		Z	J^π: D 8357.1γ to 0^+.
8366[&] *10*	(1^+)			XREF: Others: AA J^π: from (e,e′).
8382.1 *10*	(1)		Z	J^π: (D) 8381.7γ to 0^+.
8400[&] *10*	(2^-)			XREF: Others: AA J^π: from (e,e′).
8403.7 *11*			Z	
8413.5 *4*	1		V Z	J^π: D 8413.1γ to 0^+.
8430[@]			V	
8440.6 *4*	1		Z	J^π: D 8440.2γ to 0^+.
8442[&] *10*	2^-			XREF: Others: AA J^π: from (e,e′).
8467.7 *15*			Z	
8501.2 *4*	1^-[i]		Z	XREF: Others: AA
8515[@]			V	

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	Jπ	T$_{1/2}$[‡]	XREF	Comments
8518 *3*			Z	
8542[&] *10*	2⁻		V	XREF: Others: AA Jπ: from (e,e′).
8544 *4*			Z	
8553.5 *12*	1		Z	Jπ: D 8553.1γ to 0⁺.
8588.3 *7*	1		Z	Jπ: D 8587.9γ to 0⁺.
8598.2 *10*	1		Z	Jπ: D 8597.8γ to 0⁺.
8625.6 *10*	1		Z	Jπ: D 8625.2γ to 0⁺.
8627[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
8664.1 *5*	1		Z	Jπ: D 8663.7γ to 0⁺.
8701[&] *10*	(2⁻)			XREF: Others: AA Jπ: from (e,e′).
8716.6 *5*	1⁻[i]		Z	
8751.0 *8*	1		Z	Jπ: D 8750.5γ to 0⁺.
8760.4 *5*	1		Z	Jπ: D 8759.9γ to 0⁺.
8809[&] *10*	(2⁻)			XREF: Others: AA Jπ: from (e,e′).
8812.0 *13*	1[j]		Z	
8833.2 *8*	1[j]		Z	
8853[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
8874.9 *9*	1[j]		Z	
8882[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
8903.0 *8*			Z	
8911[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
8927.4 *4*			Z	
8934[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
8958.13 *15*	(15)⁻	0.5[g] ps *3*	E	Jπ: E1 899.7γ to (14)⁺.
8971[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
8978.4 *9*	(1)		Z	Jπ: (D) 8977.9γ to 0⁺.
8985 *2*			Z	
9004.7 *5*	1[j]		Z	
9014.0 *8*			Z	
9034.0 *8*			Z	
9043.6 *4*	1[j]		Z	
9053.5 *7*			Z	
9061[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
9085.1 *3*	1[j]		Z	
9101[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
9111.1 *6*	1[j]		Z	
9123.6 *7*			Z	
9127[&] *10*	2⁻			XREF: Others: AA Jπ: from (e,e′).
9137.5 *7*			Z	

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
9148.5 *3*	1^{-}[i]		Z	XREF: Others: AA
9164.9 *7*			Z	
9177.5 *5*			Z	
9187 *3*			Z	
9196.5 *3*	(1^-)		Z	J^π: (E1) 9196.0γ to 0^+.
9260.5 *6*	1[j]		Z	
9265[&] *10*	2^-			XREF: Others: AA J^π: from (e,e′).
9292.8 *5*	1[j]		Z	
9294[&] *10*	2^-			XREF: Others: AA J^π: from (e,e′).
9309.4 *7*	1[j]		Z	
9327[&] *10*	2^-			XREF: Others: AA J^π: from (e,e′).
9333.4 *6*	1^{-}[i]		Z	
9373.2 *7*			Z	XREF: Others: AA
9392.4 *8*	1[j]		Z	
9409.4 *11*			Z	
9424.3 *10*			Z	
9444.7 *4*	1[j]		Z	XREF: Others: AA
9465.1 *5*	1[j]		Z	
9486.8 *4*	1[j]		Z	
9489[&] *10*	2^-			XREF: Others: AA
9510.5 *13*	(1)		Z	XREF: Others: AA J^π: (D) 9510.0γ to 0^+.
9524.1 *13*	1[j]		Z	
9539.2 *5*	1[j]		Z	
9541[&] *10*	2^-			XREF: Others: AA
9551.4 *6*	1[j]		Z	
9563.0 *6*	1[j]		Z	
9601[&] *10*	$(1^-,2^-)$			XREF: Others: AA
9609.2 *7*			Z	
9625.1 *8*			Z	
9640.4 *8*	1[j]		Z	
9666.0 *8*	(1)		Z	J^π: (D) 9665.4γ to 0^+.
9678.3 *7*	(1^-)		Z	J^π: (E1) 9677.7γ to 0^+.
9686.9 *6*	1[j]		Z	
9694[&] *10*	2^-			XREF: Others: AA
9707.00? *25*	(16^-)	0.49[g] ps *14*	E	J^π: (M1+E2) 748.9γ to (15^-).
9733.2 *5*	1[j]		Z	
9741.7 *7*			Z	
9754.0 *6*	1[j]		Z	
9784.6 *5*			Z	
9805.4 *10*			Z	
9836.01 *18*	$(15)^+$		E	J^π: 1777.6γ to $(14)^+$.
9843.4 *6*	1[j]		Z	
9855.5 *8*	1[j]		Z	
9863[&] *10*	$(1^-,2^-)$			XREF: Others: AA
9872.4 *4*	1[j]		Z	

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
9890.7 *13*	(1)		Z	J^π: (D) 9890.1γ to 0^+.
9901.9 *13*			Z	
9932.1 *12*	1[j]		Z	
9962.8 *5*	1[j]		Z	
9984.1 *11*			Z	
10004.2 *10*	1[j]		Z	
10019.6 *11*	1[j]		Z	
10031 *2*			Z	
10042.9 *4*	(1^-)		Z	J^π: (E1) 10042.3γ to 0^+.
10083.8 *6*	1[j]		Z	
10094.2 *7*	1[j]		Z	
10104.9 *12*	(1)		Z	J^π: (D) 10104.3γ to 0^+.
10123.7 *18*	1[j]		Z	
10125.84 *18*	$(16)^+$	0.6[g] ps *2*	E	J^π: M1(+E2) 289.8γ to $(15)^+$.
10146.8 *9*	1[j]		Z	
10163.4 *8*	1[j]		Z	
10193.0 *5*	1[j]		Z	
10216.8 *10*	1[j]		Z	
10233 *4*			Z	
10241 *2*	(1)		Z	J^π: (D) 10240γ to 0^+.
10260.9 *11*			Z	
10270.0 *7*			Z	
10286.2 *6*	1[j]		Z	
10298.3 *10*	(1)		Z	J^π: (D) 10297.7γ to 0^+.
10306.6 *9*	1[j]		Z	
10315.1 *4*	1[j]		Z	
10334.9 *6*	1[j]		Z	
10361 *2*	(1)		Z	J^π: (D) 10360γ to 0^+.
10376.8 *4*	1[j]		Z	
10402.5 *9*	1[j]		Z	
10494.5 *11*	(1)		Z	J^π: (D) 10493.8γ to 0^+.
10507.9 *8*	1[j]		Z	
10524.6 *4*	1[j]		Z	
10595.0 *7*	1[j]		Z	
10618.7 *8*	1[j]		Z	
10638.5 *9*	1[j]		Z	
10682.2 *6*	1[j]		Z	
10713.2 *12*	(1)		Z	J^π: (D) 10712.5γ to 0^+.
10728.2 *11*	1[j]		Z	
10764.9 *4*	(17^+)	0.14[g] ps *14*	E	J^π: (M1+E2) 639.0γ to $(16)^+$.
10827.1 *5*	1[j]		Z	
10914 *2*	(1)		Z	J^π: (D) 10913γ to 0^+.
10957 *2*	1[j]		Z	
10987.0 *10*	1[j]		Z	
11044 *2*			Z	
11094.2 *15*			Z	
11108.0 *16*			Z	
11120.4 *9*	1[j]		Z	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	XREF	Comments
11129.2 *17*			Z	
11140 *2*			Z	
11232.4 *7*	1[j]		Z	
11243.2 *6*	1[j]		Z	
11337.7 *6*	1[j]		Z	
11403.9 *6*	(18$^+$)	0.21[g] ps *11*	E	J$^\pi$: (M1+E2) 639.0γ to (17$^+$).
11417.5 *7*	(1)		Z	J$^\pi$: (D) 11416.7γ to 0$^+$.
11452.2 *10*	1[j]		Z	
11479.7 *8*	1[j]		Z	
11501 *3*			Z	
11510 *7*			Z	
11531 *2*	1[j]		Z	
11627.9 *9*			Z	
11651.5 *8*	(1)		Z	J$^\pi$: (D) 11650.7γ to 0$^+$.
11777.4 *10*	1[j]		Z	
11788 *3*	1[j]		Z	
11963.3 *18*	(1)		Z	J$^\pi$: (D) 11962.4γ to 0$^+$.
11984 *2*	1[j]		Z	
12020.6 *8*	1[j]		Z	
12067.8 *9*	1[j]		Z	
12110.7 *6*	(19$^+$)	0.14[g] ps *5*	E	
12208.3 *12*	1[j]		Z	
12219.6 *25*			P	
12243.6 *14*	1[j]		Z	
12496.3 *18*			Z	
12880.3 *10*			Z	
12964.7 *7*	(20$^+$)	<0.35[g] ps	E	J$^\pi$: 1560.8γ to (18$^+$), 854.0γ to (19$^+$).
13110.2[a] *4*	(2)$^-$		K P ST	E(level),J$^\pi$: Probable analog of ^{90}Y g.s. Additional information 2.
13310[a] *4*	(3)$^-$		K P STU	E(level),J$^\pi$: Probable analog of ^{90}Y, 203 keV.
13940[a]			S	E(level): Possible analog of ^{90}Y, 777 keV.
14090[a]			S	E(level): Possible analog of ^{90}Y, 954 keV.
14220[a]			S	E(level): Possible analog of ^{90}Y, 1048 keV.
14270[d] *30*	(0$^-$,1$^-$)		Q ST	E(level),J$^\pi$: Probable analog of ^{90}Y, 1212 keV.
14310[a]			S	
14410[a]			ST	
14430[b]	(1$^-$)		P S	E(level),J$^\pi$: Probable analog of ^{90}Y, 1371 keV.
14748[e]	(3$^-$)		U	
14878[e]	(0$^-$)		U	
14928[e]	(1$^-$)		U	
15500[b] *30*	2$^-$,(1$^-$)		P S	E(level),J$^\pi$: Probable analog of ^{90}Y, 2474 keV.
15700[b] *30*	1$^-$,(2$^-$)		P ST	E(level),J$^\pi$: Probable analog of ^{90}Y, 2624 keV.
15900[b]	(2$^-$)		P	
16148[e]	(2$^-$)		U	
16258[e]	(1$^-$)		U	E(level),J$^\pi$: Possible analog of ^{90}Y, 3145 keV.
16290[b]			P	
17300[b]			P	
19400[b]			PQR	

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Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level)[†]	XREF
20800[b]	P
21800[c]	R
23700[c]	R

[†] From least-squares fit to Eγ, by evaluators, except where noted.
[‡] From DSAM measurements in ^{90}Zr(n,n′γ) reaction, except where noted.
[#] From ^{92}Zr(p,t).
[@] From ^{90}Zr(p,p′).
[&] From ^{90}Zr(e,e′).
[a] From ^{89}Y(p,n),(p,nγ).
[b] From ^{89}Y(p,γ).
[c] From ^{90}Zr(γ,n).
[d] From ^{89}Y(p,p).
[e] From ^{89}Y(p,p′),(p,p′γ).
[f] From ^{89}Y(^{3}He,d).
[g] From Doppler-Shift Attenuation and Recoil-Distance measurements in ^{76}Ge(^{18}O,4nγ).
[h] Doppler-shift attenuation in ^{89}Y(p,γ) (1993Sa38).
[i] From E1 transition to 0^+ ground state.
[j] From D transition to 0^+ ground state.

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$

E_i(level)	J^π_i	E_γ [†@]	I_γ [†]	E_f	J^π_f	Mult. [‡]	δ [‡]	α	Comments
1760.74	0^+	1760.70[#] *20*	[#]	0	0^+	E0[#]			E_γ: from ^{90}Nb ε decay. Probability of two-photon decay is 0.040% *5*, see ^{90}Y β^- decay. Other: 0.018% *2* with a ratio <2E1>/<2M1>of 1.9 *7* (1984Sc37). Probability of one-photon E0 transition for 1760.7 relative to internal conversion is 5×10^{-7} *2* (1990Zh20), see ^{90}Y β^- decay.
2186.273	2^+	425.5 *2*	0.027 *5*	1760.74	0^+	[E2][#]		0.00688	α(K)=0.00602 *9*; α(L)=0.000713 *10*; α(M)=0.0001239 *18*; α(N)=1.732×10^{-5} *25* α(O)=1.117×10^{-6} *16* B(E2)(W.u.)=5.2 *10*
		2186.242[#] *25*	100.0[#] *9*	0	0^+	E2[#]		5.36×10^{-4}	α(K)=0.0001223 *18*; α(L)=1.325×10^{-5} *19*; α(M)=2.29×10^{-6} *4*; α(N)=3.27×10^{-7} *5*; α(O)=2.34×10^{-8} *4* B(E2)(W.u.)=5.38 *13*
2319.000	5^-	132.716[#] *18*	5.04[#] *5*	2186.273	2^+	E3(+M4)[#]	<0.07	3.0 *9*	α(K)=2.2 *7*; α(L)=0.65 *19*; α(M)=0.12 *4*; α(N)=0.015 *5*; α(O)=0.00037 *21* B(E3)(W.u.)=0.180 *10* δ: from ^{90}Nb ε decay.
		2318.959[#] *25*	100.0[#] *2*	0	0^+	E5[#]		4.64×10^{-4}	α(K)=0.000408 *6*; α(L)=4.63×10^{-5} *7*; α(M)=8.04×10^{-6} *12*; α(N)=1.141×10^{-6} *16*; α(O)=7.97×10^{-8} *12* B(E5)(W.u.)=8.74 *33*
2739.29	$(4)^-$	420.28[#] *5*	100[#]	2319.000	5^-	[#]			
2747.875	3^-	429.0[e] *3*	0.53 *11*	2319.000	5^-	[E2]			B(E2)(W.u.)=0.53 *+18−13*
		561.604 *11*	100.0 *3*	2186.273	2^+	E1			B(E1)(W.u.)=1.17×10^{-4} *+27−18* E_γ: from ^{90}Nb ε decay. Mult.: D from $\gamma(\theta)$ in (n,n′γ); E1 from $\Delta\pi$=yes.
		2747.47 *5*	6.1 *3*	0	0^+	E3			B(E3)(W.u.)=8.0 *+18−13* Mult.: O from $\gamma(\theta)$ in (n,n′γ); M3 excluded by comparison to RUL.
3076.925	4^+	329.09 *3*	6.74 *18*	2747.875	3^-	E1			E_γ: weighted average of 329.058 *16* (^{90}Nb ε decay) and 329.125 *15* (^{90}Zr(n,n′γ)). I_γ: weighted average of 6.82 *23* (^{90}Nb ε decay) and 6.6 *3* (^{90}Zr(n,n′γ)). Mult.: D from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=yes from level scheme.
		337.61 *14*	0.90 *11*	2739.29	$(4)^-$				E_γ: weighted average of 337.50 *15* (^{90}Nb ε decay) and 337.8 *2* (^{90}Zr(n,n′γ)). I_γ: weighted average of 1.4 *5* (^{90}Nb ε decay) and 0.88 *11* (^{90}Zr(n,n′γ)).

$^{90}_{40}Zr_{50}$-14

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
3076.925	4^+	757.86 *7*	2.66 *21*	2319.000	5^-				E_γ: weighted average of 757.95 *5* (^{90}Nb ε decay) and 757.80 *4* (^{90}Zr(n,n′γ)). I_γ: weighted average of 2.23 *23* (^{90}Nb ε decay) and 2.76 *11* (^{90}Zr(n,n′γ)).
		890.629 *14*	100.0 *3*	2186.273	2^+	E2[b]		8.82×10^{-4}	α(K)=0.000777 *11*; α(L)=8.69×10^{-5} *13*; α(M)=1.507×10^{-5} *22*; α(N)=2.13×10^{-6} *3* α(O)=1.479×10^{-7} *21*
3308.10	2^+	1121.990 *22*	45 *4*	2186.273	2^+	M1+E2	+0.25		B(E2)(W.u.)=3.5 *+15−13*; B(M1)(W.u.)=0.065 *6* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.
		1547.5	3.9 *10*	1760.74	0^+	[E2]			B(E2)(W.u.)=1.03 *26*
		3308.1 *2*	100 *4*	0	0^+	E2			B(E2)(W.u.)=0.589 *38* Mult.: Q from $\gamma(\theta)$ in (n,n′γ); M2 excluded by comparison to RUL.
3448.230	6^+	371.307[#] *8*	1.95[#] *7*	3076.925	4^+	E2[#]		0.01064	α(K)=0.00929 *13*; α(L)=0.001119 *16*; α(M)=0.000194 *3*; α(N)=2.71×10^{-5} *4*; α(O)=1.712×10^{-6} *24* B(E2)(W.u.)<46
		1129.224[#] *15*	100.0[#] *4*	2319.000	5^-	E1[#]		2.42×10^{-4} *8*	α(K)=0.000203 *7*; α(L)=2.20×10^{-5} *8*; α(M)=3.82×10^{-6} *14*; α(N)=5.42×10^{-7} *20*; α(O)=3.86×10^{-8} *14* B(E1)(W.u.)<1.6×10^{-4}
3589.418	8^+	141.178[#] *15*	100.0[#] *10*	3448.230	6^+	E2[#]			α(K)=0.27 *3*; α(L)=0.040 *5*; α(M)=0.0071 *9*; α(N)=0.00095 *13*; α(O)=4.6×10^{-5} *7* B(E2)(W.u.)=2.41 *7*
		1270.396[#] *18*	1.94[#] *4*	2319.000	5^-	(E3)[#]		7.63×10^{-4}	α(K)=0.000667 *10*; α(L)=7.56×10^{-5} *11*; α(M)=1.313×10^{-5} *19*; α(N)=1.86×10^{-6} *3* α(O)=1.285×10^{-7} *18* B(E3)(W.u.)=0.0523 *20*
3842.34	2^+	1656.05 *11*	17.0 *15*	2186.273	2^+	M1+E2	+1.1	3.72×10^{-4} *10*	α(K)=0.000208 *5*; α(L)=2.27×10^{-5} *5*; α(M)=3.93×10^{-6} *8*; α(N)=5.59×10^{-7} *12*; α(O)=4.00×10^{-8} *10* B(E2)(W.u.)=10.0 *+20−23*; B(M1)(W.u.)=0.022 *5* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.
		3842.2 *10*	100.0 *15*	0	0^+	E2			B(E2)(W.u.)=1.60 *+14−12* Mult.: Q from $\gamma(\theta)$ in (n,n′γ); M2 excluded by comparison to RUL.
3932.4		3932.3[a] *6*	100[a]	0	0^+	[a]			
3958.59	5^-	1219.33 *3*	53.8 *12*	2739.29	$(4)^-$	(M1+E2)	+0.08		B(E2)(W.u.)=0.59 *+32−22*; B(M1)(W.u.)=0.128 *+29−20* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
3958.59	5^-	1639.60 *4*	100.0 *12*	2319.000	5^-	(M1+E2)	+0.06		B(E2)(W.u.)=0.14 *+7−5*; B(M1)(W.u.)=0.098 *+22−15* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.
4058.07	4^+	981.31 *7*	7.8 *15*	3076.925	4^+	(M1+E2)	−0.11		B(E2)(W.u.)=0.18 *+13−9*; B(M1)(W.u.)=0.013 *+7−5* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.
		1310.00 *18*	4.3 *14*	2747.875	3^-	[E1]			B(E1)(W.u.)=4.7×10^{-5} *+27−21*
		1318.92 *19*	2.4 *13*	2739.29	$(4)^-$	[E1]			B(E1)(W.u.)=2.6×10^{-5} *+20−14*
		1871.90 *3*	100 *3*	2186.273	2^+	E2			B(E2)(W.u.)=7.5 *+38−25* Mult.: Q from $\gamma(\theta)$ in (n,n′γ); M2 excluded by comparison to RUL.
4124.49	0^+	1938.26 *6*	100	2186.273	2^+				
4225.35	(4^-)	1478.02 *16*	22 *4*	2747.875	3^-				
		1485.75 *14*	100 *4*	2739.29	$(4)^-$	(M1+E2)	+0.31		B(E2)(W.u.)=10.7 *45*; B(M1)(W.u.)=0.21 *+7−5* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
		1906.50 *17*	27 *6*	2319.000	5^-	(M1+E2)	−0.57		B(E2)(W.u.)=2.1 *+11−8*; B(M1)(W.u.)=0.022 *+9−6* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
4229.05	2^+	1481.40 *6*	65 *15*	2747.875	3^-				
		2042.73 *4*	100 *12*	2186.273	2^+	M1+E2	+0.04		B(E2)(W.u.)=0.020 *+10−8*; B(M1)(W.u.)=0.050 *8*
		4229.3 *2*	28 *5*	0	0^+	E2			B(E2)(W.u.)=0.094 *+22−19* Mult.: Q from $\gamma(\theta)$ in (n,n′γ), M2 excluded by comparison to RUL.
4232.220	(6^-)	643[#e]	<1.5[#]	3589.418	8^+				
		784[#e]	<0.5[#]	3448.230	6^+				
		1155[#e]	<0.4[#]	3076.925	4^+				
		1493[#e]	<0.7[#]	2739.29	$(4)^-$				
		1913.194[#] *25*	100.0[#] *13*	2319.000	5^-	(M1+E2)	+0.5	4.27×10^{-4} *16*	α(K)=0.000158 *3*; α(L)=1.71×10^{-5} *4*; α(M)=2.97×10^{-6} *6*; α(N)=4.23×10^{-7} *8*; α(O)=3.03×10^{-8} *7* B(E2)(W.u.)=4.0 *+34−21*; B(M1)(W.u.)=0.055 *+40−25* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
4236.96	$(1,2^+)$	929.01 *18*	7.7 *3*	3308.10	2^+				
		2050.81 *9*	27 *5*	2186.273	2^+				
		2476.22 *4*	100 *5*	1760.74	0^+				
		4237.0[e] *15*		0	0^+				E_γ: observed only in (p,p′γ) (1974Ce03).
4262.37	(3^+)	954.2 *1*	19.9 *17*	3308.10	2^+	(M1+E2)	+0.06		B(E2)(W.u.)=0.026 *+15−13*; B(M1)(W.u.)=0.0063 *21* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.

$^{90}_{40}Zr_{50}$-16

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	Comments
4262.37	(3^+)	1185.56 5	41 4	3076.925	4^+	(M1+E2)	−3.1	B(E2)(W.u.)=4.6 16; B(M1)(W.u.)=6.3×10^{-4} +39−26 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
		1514.8 1	43 7	2747.875	3^-			
		1523.07 4	84.7 20	2739.29	$(4)^-$			
		2076.20 4	100 5	2186.273	2^+	(M1+E2)	+0.6	B(E2)(W.u.)=0.20 9; B(M1)(W.u.)=0.0022 8 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
4299.12	(5^-)	1559.91 7	50.4 17	2739.29	$(4)^-$	(M1+E2)	+0.34	B(E2)(W.u.)=2.9 +13−10; B(M1)(W.u.)=0.056 +14−10 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
		1980.06 8	100.0 17	2319.000	5^-	(M1+E2)	+0.85	B(E2)(W.u.)=7.0 +24−19; B(M1)(W.u.)=0.035 +11−8 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
4319.2?		2000.2[d#e] 3	100[d#]	2319.000	5^-			
4331.93	4^+	1255.18 3	74.5 21	3076.925	4^+	M1+E2		B(E2)(W.u.)<99; B(M1)(W.u.)<0.15 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=no from level scheme.
		1584.25 4	100 3	2747.875	3^-	[E1]		B(E1)(W.u.)=0.00118 +22−17
		2012.9 2	20 4	2319.000	5^-	[E1]		B(E1)(W.u.)=1.15×10^{-4} +30−26
4348.10	(4^+)	1608.8		2739.29	$(4)^-$			
		2161.87 3		2186.273	2^+			
4375.07	7^-	2055.77 7	100	2319.000	5^-	E2		Mult.: Q from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=no from level scheme.
4426.43	0^+	2240.20 5	100	2186.273	2^+	[E2]		B(E2)(W.u.)=2.1 +15−11
4454.71	(5^+)	1377.74 12	16 3	3076.925	4^+			
		1715.73 14	19 7	2739.29	$(4)^-$			
		2135.70 5	100 7	2319.000	5^-			
4455.58	(2)	1707.90 5	75 4	2747.875	3^-	D+Q	+0.024	
		2269.40 4	100 4	2186.273	2^+			
4474.31	4^+	1726.68 7	100 5	2747.875	3^-	[E1]		B(E1)(W.u.)=3.1×10^{-4} +21−16
		1735.0	40 5	2739.29	$(4)^-$	[E1]		B(E1)(W.u.)=1.2×10^{-4} +8−6
4494.79	(3^-)	1747.2 2	5 3	2747.875	3^-			
		1755.49 4	100 3	2739.29	$(4)^-$	D+Q	−0.02	
4507.0		4506.9[a] 8	100[a]	0	0^+			
4533.52	(3^-)	1225.3[e] 2	17.7 22	3308.10	2^+			
		1456.78 4	100 11	3076.925	4^+			
		1794.15 6	39 4	2739.29	$(4)^-$	(M1+E2)	+2.0	B(E2)(W.u.)=3.4 +23−13; B(M1)(W.u.)=0.0025 +23−10 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
		2347.3	14 4	2186.273	2^+			
4537.70	(4^-)	1460.95 6	63 6	3076.925	4^+			
		2218.65 7	100 6	2319.000	5^-	(M1+E2)	−0.36	B(E2)(W.u.)=0.24 +18−11; B(M1)(W.u.)=0.008 +5−3 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), non zero value of δ suggests $\Delta\pi$=no.
4541.37	6^+	222[#]	<1.0[#]	4319.2?				
		309[#e]	<1.4[#]	4232.220	(6^-)	[E1]		B(E1)(W.u.)<0.0033
		952[#e]	<1.4[#]	3589.418	8^+	[E2]		B(E2)(W.u.)<8.6

$^{90}_{40}Zr_{50}$-17

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ †@	I_γ †	E_f	J^π_f	Mult.‡	δ‡	Comments
4541.37	6^+	1092.97 *9*	8.1 *22*	3448.230	6^+			I_γ: other: 15.8 *13* in ^{90}Nb ε decay.
		1464#e	<3.7#	3076.925	4^+	[E2]		B(E2)(W.u.)<2.6
		2222.43 *3*	100.0 *22*	2319.000	5^-	[E1]		B(E1)(W.u.)=4.7×10^{-4} *11*
4562.02	5	1822.74 *5*	100	2739.29	$(4)^-$			
4578.93	(1)	2818.33 *10*	100 *8*	1760.74	0^+			
		4578.7 *2*	83 *8*	0	0^+			
4591.37	(3^+)	1843.70 *5*	100.0 *12*	2747.875	3^-			
		2405.18 *7*	36.6 *12*	2186.273	2^+	(M1+E2)	−0.07	B(E2)(W.u.)=0.0027 *+15−11*; B(M1)(W.u.)=0.0031 *8* Mult.: D+Q from γ(θ) in (n,n′γ); Δπ=no from level scheme.
4614.42	(6^+)	1166.24 *12*	100 *10*	3448.230	6^+			
		1537.64 *12*	75 *10*	3076.925	4^+			
		2295.5	75 *8*	2319.000	5^-			
4640.94	7,8	409#e	<4.2#	4232.220	(6^-)			
		1051.53# *4*	100# *4*	3589.418	8^+			
		1192.7# *1*	7.7# *8*	3448.230	6^+			
		2322#e	<3.8#	2319.000	5^-			
4646.7	$1,2^+$	2884.8 *13*	100 *3*	1760.74	0^+			
		4646.6 *3*	18 *3*	0	0^+			
4681.26	2^+	1933.77 *8*	100 *10*	2747.875	3^-	[E1]		B(E1)(W.u.)=7.5×10^{-4} *+23−15*
		2495.1	42 *6*	2186.273	2^+			
		4680.8 *2*	58 *8*	0	0^+	E2		B(E2)(W.u.)=0.098 *+32−21* Mult.: Q from γ(θ) in (n,n′γ), M2 excluded by comparison to RUL.
4701.10	2^+	1953.26 *17*	100 *5*	2747.875	3^-	[E1]		B(E1)(W.u.)=4.0×10^{-4} *6*
		2514.76 *13*	39 *3*	2186.273	2^+			
		2940.60 *12*	95 *4*	1760.74	0^+	E2		B(E2)(W.u.)=0.88 *+15−12* Mult.: Q from γ(θ) in (n,n′γ), M2 excluded by comparison to RUL.
		4701.2 *3*	19 *4*	0	0^+	E2		B(E2)(W.u.)=0.0168 *+46−40* Mult.: Q from γ(θ) in (n,n′γ), M2 excluded by comparison to RUL.
4774.29		537.34 *5*	34 *3*	4236.96	$(1,2^+)$			
		2587.96 *25*	100 *3*	2186.273	2^+			
4781.81	$4,(3^-)$	2462.81 *19*	100	2319.000	5^-			
4795.6	2^+	4795.5 *3*	100	0	0^+	E2		B(E2)(W.u.)=1.3 *+10−6* Mult.: Q from γ(θ) in (n,n′γ), M2 excluded by comparison to RUL.
4814.44	(3^-)	2066.95 *8*	100 *7*	2747.875	3^-	D+Q	+0.34	
		2495.5	16 *3*	2319.000	5^-			
		2628.01 *10*	16 *3*	2186.273	2^+			
4818.02	$(3,4^+)$	975.75 *15*	16 *3*	3842.34	2^+			
		2070.39 *7*	100 *3*	2747.875	3^-			
4824.21	2^+	1747.2 *2*	8 *5*	3076.925	4^+	[E2]		B(E2)(W.u.)=2.3 *+15−12*
		2638.07 *11*	100 *5*	2186.273	2^+	M1+E2		B(E2)(W.u.)<5.0; B(M1)(W.u.)<0.032 Mult.: D+Q from γ(q) in (n,n′γ), Δπ=no from level scheme.

$^{90}_{40}Zr_{50}$-18

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ [†@]	I_γ [†]	E_f	J^π_f	Mult. [‡]	δ [‡]	α	Comments
4824.21	2^+	4823.9 *5*	17 *3*	0	0^+	[E2]			B(E2)(W.u.)=0.031 *9*
4840.27	5^-	1763.46 *6*	100 *6*	3076.925	4^+				
		2092.7	43 *6*	2747.875	3^-				
4867.47	5^+	1419.23 *10*	53 *5*	3448.230	6^+	M1+E2	−1.0		B(E2)(W.u.)=4.6 *+21−16*; B(M1)(W.u.)=0.0086 *+41−27* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), E1+M2 excluded by comparison to RUL.
		1790.73 *8*	100 *8*	3076.925	4^+	M1+E2	+0.8		B(E2)(W.u.)=2.1 *+10−8*; B(M1)(W.u.)=0.0098 *+45−29* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), E1+M2 excluded by comparison to RUL.
		2128.2	17 *7*	2739.29	$(4)^-$				
4932.6	$1,2^+$	4932.5 *4*	100	0	0^+				
4941.89	(4^+)	1865.03 *8*	100 *3*	3076.925	4^+				
		2623.0 *2*	32 *3*	2319.000	5^-	[E1]			B(E1)(W.u.)=9.2×10^{-5} *+25−17*
4992.36		1150.3	30 *3*	3842.34	2^+				
		1684.35 *8*	100 *5*	3308.10	2^+				
		2244.5 *3*	31 *3*	2747.875	3^-				
		2252.9 *2*	20 *3*	2739.29	$(4)^-$				
5059.975	7^+	518.60 [#] *6*	29.0 [#] *21*	4541.37	6^+				
		827.74 [#] *4*	46.6 [#] *7*	4232.220	(6^-)	E1 [#]			α(K)=0.000371 *6*; α(L)=4.04×10^{-5} *6*; α(M)=6.99×10^{-6} *10*; α(N)=9.93×10^{-7} *14*; α(O)=7.02×10^{-8} *10*
		1470.528 [#] *24*	19.3 [#] *7*	3589.418	8^+				
		1611.76 [#] *3*	100 [#] *3*	3448.230	6^+	M1,E2 [#]			α(K)=0.000220 *5*; α(L)=2.39×10^{-5} *5*; α(M)=4.14×10^{-6} *9*; α(N)=5.90×10^{-7} *13*; α(O)=4.21×10^{-8} *11*
		2741.0 [#] *3*	0.31 [#] *10*	2319.000	5^-	E3			α(K)=0.0001277 *18*; α(L)=1.391×10^{-5} *20*; α(M)=2.41×10^{-6} *4*; α(N)=3.43×10^{-7} *5*; α(O)=2.46×10^{-8} *4*
5068.6	$1,2^+$	5068.4 *6*	100	0	0^+				
5084.03	2,3	2336.18 *10*	100 *7*	2747.875	3^-				
		2345.7 *3*	37 *7*	2739.29	$(4)^-$				
5090.30	(3^-)	2904.03 *23*	100	2186.273	2^+				
5107.92	$(3),4^+$	2368.6		2739.29	$(4)^-$				
		2921.7 *2*		2186.273	2^+				
5112.6	3^-	2365.0 *10*	100	2747.875	3^-	(M1+E2)	−0.1		Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=no from level scheme.
5164.484	$(8)^+$	524 [#e]	<3.7 [#]	4640.94	7,8				
		623 [#e]	<3.7 [#]	4541.37	6^+				
		932 [#e]	<22 [#]	4232.220	(6^-)				
		1575.035 [#] *23*	100 [#] *4*	3589.418	8^+	M1,E2 [#]		3.64×10^{-4} *8*	α(K)=0.000230 *5*; α(L)=2.50×10^{-5} *5*; α(M)=4.34×10^{-6} *9*; α(N)=6.17×10^{-7} *13*; α(O)=4.41×10^{-8} *11*
		1716.27 [#] *3*	97 [#] *4*	3448.230	6^+	(E2) [#]		3.91×10^{-4}	α(K)=0.000191 *3*; α(L)=2.08×10^{-5} *3*; α(M)=3.61×10^{-6} *5*; α(N)=5.14×10^{-7} *8*; α(O)=3.66×10^{-8} *6*

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J_i^π	E_γ[†@]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α	Comments
									α(K)=0.000191 *3*; α(L)=2.08×10^{-5} *3*; α(M)=3.61×10^{-6} *5*; α(N)=5.14×10^{-7} *8*; α(O)=3.66×10^{-8} *6*
5164.484	$(8)^+$	2845[#e]	<0.3[#]	2319.000	5^-				
5171.90	(4)	2432.0 *3*	56 *5*	2739.29	$(4)^-$				
		2853.06 *14*	100 *5*	2319.000	5^-				
5175.8	$3,4^+$	2989.5 *3*	100	2186.273	2^+				
5183.61	$1,2^+$	2997.5 *2*	85 *13*	2186.273	2^+				
		5183.2 *3*	100 *13*	0	0^+				
5222.97	(4^+)	2483.67 *19*	100	2739.29	$(4)^-$				
5232.3		3046.0 *3*	100	2186.273	2^+				
5247.52	9^+	1658.10[b] *4*	100[b]	3589.418	8^+	E2(+M1)[b]	+14 *14*	3.80×10^{-4} *17*	α(K)=0.000205 *8*; α(L)=2.23×10^{-5} *7*; α(M)=3.86×10^{-6} *13*; α(N)=5.49×10^{-7} *19*; α(O)=3.91×10^{-8} *17* B(M1)(W.u.)>2.2×10^{-7}
5270.74		2531.44 *16*	100	2739.29	$(4)^-$				
5275.4	(2^+)	5275.2	100[@]	0	0^+	(E2)		1.59×10^{-3}	α(K)=2.94×10^{-5} *5*; α(L)=3.14×10^{-6} *5*; α(M)=5.44×10^{-7} *8*; α(N)=7.75×10^{-8} *11*; α(O)=5.59×10^{-9} *8* B(E2)(W.u.)=0.0072 *+12−15* Mult.: from ^{89}Y(p,γ).
5305.97	2^+	5305.8 *2*	100	0	0^+	E2			B(E2)(W.u.)=0.33 *+14−7* Mult.: Q from γ(θ) in (n,n′γ), M2 excluded by comparison to RUL.
5307.75	$(3^-,4^+)$	2560.2 *4*	13 *5*	2747.875	3^-				
		2988.9 *2*	20 *4*	2319.000	5^-				
		3121.3 *2*	100 *7*	2186.273	2^+				
5312.77	$1,2^+$	3551.4[e] *6*		1760.74	0^+				
		5312.6 *2*		0	0^+				
5317.7	3^-	2570.2 *4*	100 *12*	2747.875	3^-				
		3131.2 *4*	72 *12*	2186.273	2^+	[E1]			B(E1)(W.u.)=2.5×10^{-5} *11*
5359.22	3,4	2282.4 *2*	100	3076.925	4^+				
5379.8	(4^+)	3193.6 *3*	100	2186.273	2^+	[E2]			B(E2)(W.u.)=3.6 *+9−6*
5426.01	3^-	2118.1 *2*	100 *18*	3308.10	2^+	[E1]			B(E1)(W.u.)=3.3×10^{-4} *+13−10*
		3106.8 *2*	80 *14*	2319.000	5^-	E2			B(E2)(W.u.)=0.60 *+24−18* Mult.: Q from γ(θ) in (n,n′γ), M2 excluded by comparison to RUL.
		3239.7 *2*	28 *6*	2186.273	2^+	[E1]			B(E1)(W.u.)=2.6×10^{-5} *+11−9*
5432.790	$7^+,8^+$	268[#e]	<0.6[#]	5164.484	$(8)^+$				
		792.05[#] *19*	1.5[#] *5*	4640.94	7,8				
		891[#e]	<8.3[#]	4541.37	6^+				
		1057.8[#] *1*	2.5[#] *8*	4375.07	7^-				

$^{90}_{40}Zr_{50}$-20

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
5432.790	7+,8+	1201[#e]	<2.7[#]	4232.220	(6−)				
		1843.342[#] 22	100.0[#] 24	3589.418	8+	M1,E2[#]		4.08×10^{-4} 14	α(K)=0.000170 4; α(L)=1.84×10^{-5} 4; α(M)=3.19×10^{-6} 6; α(N)=4.54×10^{-7} 9; α(O)=3.25×10^{-8} 8
		1984.54[#] 3	99[#] 4	3448.230	6+				
		3114[#e]	<0.24[#]	2319.000	5−				
5437.33	2+	2690.08 23	100 3	2747.875	3−	[E1]			B(E1)(W.u.)=4.5×10^{-4} 7
		3676.6 2	34 3	1760.74	0+	E2			B(E2)(W.u.)=0.30 +6−4 Mult.: Q from $\gamma(\theta)$ in (n,n′γ), M2 excluded by comparison to RUL.
		5436.9 2	29.1 18	0	0+	E2			B(E2)(W.u.)=0.037 +7−5 Mult.: Q from $\gamma(\theta)$ in (n,n′γ), M2 excluded by comparison to RUL.
5457.70	(4+)	2380.6 3	52 17	3076.925	4+				
		2710.2 2	100 17	2747.875	3−	[E1]			B(E1)(W.u.)=9.6×10^{-5} 12
5504.75		3744.5 5	100 5	1760.74	0+				
		5504.5 2	75 5	0	0+				
5513.41	(3,4)	2436.5 3	53 13	3076.925	4+				
		2765.8 2	100 13	2747.875	3−				
5564.2		3377.9 4	100	2186.273	2+				
5590.58	2+	2842.9 2	35 6	2747.875	3−	[E1]			B(E1)(W.u.)=1.68×10^{-4} +36−31
		3404.1 2	100 5	2186.273	2+				
		5590.9 3	57 3	0	0+	E2			B(E2)(W.u.)=0.081 +13−11 Mult.: Q from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=no from level scheme.
5601.8		3415.5 4	100	2186.273	2+				
5607.6		2299.5 3	100	3308.10	2+				
5644.02	10+	2054.55[b] 5	100[b]	3589.418	8+	E2[b]		4.88×10^{-4}	α(K)=0.0001368 20; α(L)=1.484×10^{-5} 21; α(M)=2.57×10^{-6} 4; α(N)=3.66×10^{-7} 6; α(O)=2.62×10^{-8} 4 B(E2)(W.u.)>0.023
5651.1		2911.8 3	100	2739.29	(4)−				
5724.3		3538.0 4	100	2186.273	2+				
5775.1		3588.8 5	100	2186.273	2+				
5785.0		5784.8[a] 4	100[a]	0	0+				
5792.05	(9+)	2202.603[b] 30	100[b]	3589.418	8+	(M1+E2)[b]	−0.07 4	5.03×10^{-4}	α(K)=0.0001227 18; α(L)=1.327×10^{-5} 19; α(M)=2.30×10^{-6} 4; α(N)=3.28×10^{-7} 5; α(O)=2.36×10^{-8} 4 δ: from $\gamma(\theta)$ and γ(lin pol) in (^{18}O,4nγ).
5808		5807.7[a] 3	100[a]	0	0+				

$^{90}_{40}Zr_{50}$-21

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
5821.8		3635.5 *6*	100	2186.273	2^+				
5846.4		3660.1 *5*	100	2186.273	2^+				
5884.4		5884.2[a] *4*	100[a]	0	0^+				
6279.70	11^+	1032.19[b] *10*	100[b] *4*	5247.52	9^+	E2[b]		6.24×10^{-4}	α(K)=0.000551 *8*; α(L)=6.11×10^{-5} *9*; α(M)=1.060×10^{-5} *15*; α(N)=1.502×10^{-6} *21* α(O)=1.050×10^{-7} *15*
6296	1^-	6295.6[a] *2*	100[a]	0	0^+	E1[a]			
6376.10	(10^-)	584.04[b] *8*	[b]	5792.05	(9^+)				
		1128.2[b] *7*	[b]	5247.52	9^+				
6389.8	1	6389.6[a] *3*	100[a]	0	0^+	D[a]			
6424.3	1^-	6424.1[a] *3*	100[a]	0	0^+	E1[a]			
6565.7	1	6565.4[a] *3*	100[a]	0	0^+	D[a]			
6640.1	(2^+)	6640.1	100[@]	0	0^+	(E2)			B(E2)(W.u.)=0.087 *+34−22* Mult.: From $^{89}Y(p,\gamma)$.
6669.2	1	6668.9[a] *7*	100[a]	0	0^+	D[a]			
6721.11	(10^-)	345.24[b] *20*	100[b] *8*	6376.10	(10^-)				
		441.42[be] *13*	≤11.6[b]	6279.70	11^+				
		929.03[be] *9*	≤23.3[b]	5792.05	(9^+)				
		1077.06[be] *8*	≤23.3[b]	5644.02	10^+				
		1473.65[b] *20*	45[b] *5*	5247.52	9^+				
		1556.63[be] *9*	≤17.4[b]	5164.484	$(8)^+$				
6761.4	1^-	6761.1[a] *2*	100[a]	0	0^+	E1[a]			
6769.51	(12^+)	489.81[b] *15*	100[b]	6279.70	11^+	(M1+E2)[b]	−0.26 *6*	0.00342 *6*	α(K)=0.00302 *5*; α(L)=0.000337 *6*; α(M)=5.86×10^{-5} *11*; α(N)=8.31×10^{-6} *15*; α(O)=5.85×10^{-7} *10*
6876	1^-	6876[a] *3*	100[a]	0	0^+	E1[a]			
6953.94	$(11)^-$	1309.83[b] *7*	100[b]	5644.02	10^+	E1(+M2)[b]	+0.02 *2*	2.90×10^{-4} *5*	α(K)=0.0001560 *23*; α(L)=1.687×10^{-5} *25*; α(M)=2.92×10^{-6} *5*; α(N)=4.15×10^{-7} *7*; α(O)=2.96×10^{-8} *5* B(E1)(W.u.)>5.3×10^{-6} δ: from $\gamma(\theta)$ in γ(lin pol) in $(^{18}O,4n\gamma)$.
6960.4	1	6960.1[a] *7*	100[a]	0	0^+	D[a]			
7008.63	(11^-)	54.66[b] *5*	11.9[b] *17*	6953.94	$(11)^-$				
		287.55[b] *7*	100[b] *3*	6721.11	(10^-)	M1+E2[b]	−0.07 *5*	0.01235 *21*	α(K)=0.01087 *19*; α(L)=0.001231 *23*; α(M)=0.000214 *4*; α(N)=3.03×10^{-5} *6*;

From ENSDF

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
									α(O)=2.13×10^{-6} 4 δ: from $\gamma(\theta)$ in γ(lin pol) in (^{18}O,4nγ).
7008.63	(11$^-$)	1364.73[b] 20	73[b] 3	5644.02	10$^+$	(E1(+M2))[b]	−0.01 2	3.12×10^{-4}	α(K)=0.0001452 21; α(L)=1.569×10^{-5} 23; α(M)=2.72×10^{-6} 4; α(N)=3.86×10^{-7} 6; α(O)=2.75×10^{-8} 4 δ: from $\gamma(\theta)$ in γ(lin pol) in (^{18}O,4nγ).
7025.59	(10$^+$)	1233.54[b] 10	28[b] 4	5792.05	(9$^+$)				
		1381.78[b] 30	9.6[b] 10	5644.02	10$^+$				
		1778.10[b] 7	100[b] 10	5247.52	9$^+$				
		1861.37[b] 30	26.8[b] 13	5164.484	(8)$^+$	(E2)[b]		4.26×10^{-4}	α(K)=0.0001642 23; α(L)=1.785×10^{-5} 25; α(M)=3.09×10^{-6} 5; α(N)=4.40×10^{-7} 7; α(O)=3.14×10^{-8} 5
7042.0	1	7041.7[a] 7	100[a]	0	0$^+$	D[a]			
7085.6	(1)	7085.3[a] 10	100[a]	0	0$^+$	(D)[a]			
7194.35	(11$^+$)	168.760[b] 4	44.5[b] 15	7025.59	(10$^+$)	M1+E2[b]		0.11 6	α(K)=0.09 5; α(L)=0.012 8; α(M)=0.0022 13; α(N)=0.00030 18; α(O)=1.6×10^{-5} 8 B(E2)(W.u.)>0.0017; B(M1)(W.u.)>4.5×10^{-8}
		818.23[b] 5	100.0[b] 29	6376.10	(10$^-$)	E1(+M2)[b]	−0.02 4	4.30×10^{-4} 10	α(K)=0.000380 9; α(L)=4.15×10^{-5} 10; α(M)=7.18×10^{-6} 16; α(N)=1.019×10^{-6} 23; α(O)=7.20×10^{-8} 16 B(E1)(W.u.)>1.3×10^{-5} δ: from $\gamma(\theta)$ and γ(lin pol) in (^{18}O),4nγ).
		1402.27[b] 7	<1.5[b]	5792.05	(9$^+$)				
		1550.27[b] 30	5.1[b] 5	5644.02	10$^+$	D			
7198.2	1	7197.9[a] 6	100[a]	0	0$^+$	D[a]			
7223.89	(12)$^+$	29.57 8	18 3	7194.35	(11$^+$)	(M1)		6.74 11	α(K)=5.90 10; α(L)=0.702 12; α(M)=0.1222 20; α(N)=0.0172 3; α(O)=0.001165 19 B(M1)(W.u.)=0.90 +19−16
		215.27 4	47 4	7008.63	(11$^-$)	[E1]			B(E1)(W.u.)=9.3×10^{-5} +24−16
		269.93 5	100 3	6953.94	(11)$^-$	E1(+M2)	−0.02 3	0.00651 16	α(K)=0.00575 14; α(L)=0.000638 17; α(M)=0.000110 3; α(N)=1.55×10^{-5} 5; α(O)=1.06×10^{-6} 3 B(E1)(W.u.)=1.00×10^{-4} +22−16 δ: from $\gamma(\theta)$ and γ(lin pol) in (^{18}O),4nγ).
		1580.00 30	2.5 3	5644.02	10$^+$	(E2)		3.70×10^{-4}	α(K)=0.000225 4; α(L)=2.45×10^{-5} 4; α(M)=4.25×10^{-6} 6; α(N)=6.04×10^{-7} 9;

$^{90}_{40}Zr_{50}$-23

Adopted Levels, Gammas (continued)

γ(^{90}Zr) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$[†@]	I$_\gamma$[†]	E$_f$	J$^\pi_f$	Mult.[‡]	δ[‡]	α	Comments
									α(K)=0.000225 4; α(L)=2.45×10^{-5} 4; α(M)=4.25×10^{-6} 6; α(N)=6.04×10^{-7} 9; α(O)=4.29×10^{-8} 6 B(E2)(W.u.)=3.5×10^{-4} +9−7
7250	1$^-$	7248.9[a] 3	100[a]	0	0$^+$	E1[a]			
7280.9		7280.6[a] 7	100[a]	0	0$^+$				
7361.0	1	7360.8[a] 6	100[a]	0	0$^+$	D[a]			
7387.6	1	7387.3[a] 4	100[a]	0	0$^+$	D[a]			
7424.5		7424.2[a] 10	100[a]	0	0$^+$				
7433.8	1	7433.5[a] 8	100[a]	0	0$^+$	D[a]			
7437.82	(13)$^+$	213.93[b] 4	100[b]	7223.89	(12)$^+$	M1+E2[b]	−0.07 3	0.0264 5	α(K)=0.0232 4; α(L)=0.00265 5; α(M)=0.000461 8; α(N)=6.53×10^{-5} 12; α(O)=4.55×10^{-6} 7 B(E2)(W.u.)=9×10^{1} +9−6; B(M1)(W.u.)=0.75 +16−11 δ: from γ(θ) and γ(lin pol) in (^{18}O),4nγ).
7468		7468[a] 2	100[a]	0	0$^+$				
7474.9	(1)	7474.6[a] 3	100[a]	0	0$^+$	(D)[a]			
7649.9	(2$^+$)	7649.6	100	0	0$^+$	(E2)			B(E2)(W.u.)=0.00164 24 E$_\gamma$,I$_\gamma$,Mult.: from ^{89}Y(p,γ).
7685.8	1	7685.4[a] 4	100[a]	0	0$^+$	D[a]			
7702.9	1$^-$	7702.5[a] 3	100[a]	0	0$^+$	E1[a]			
7723.1		7722.7[a] 9	100[a]	0	0$^+$				
7759.7	(1)	7759.3[a] 6	100[a]	0	0$^+$	(D)[a]			
7779.0	1	7778.6[a] 6	100[a]	0	0$^+$	D[a]			
7807.9	1	7807.5[a] 3	100[a]	0	0$^+$	D[a]			
7857.8	(1)	7857.4[a] 7	100[a]	0	0$^+$	(D)[a]			
7935.6	1	7935.2[a] 3	100[a]	0	0$^+$	D[a]			
7976.6	1	7976.2[a] 4	100[a]	0	0$^+$	D[a]			
8006.9	1	8006.5[a] 8	100[a]	0	0$^+$	D[a]			
8058.41	(14)$^+$	620.58[b] 8	100[b] 3	7437.82	(13)$^+$	M1+E2	−0.14 5	0.00209 16	α(K)=0.00184 14; α(L)=0.000208 19; α(M)=3.6×10^{-5} 4; α(N)=5.1×10^{-6} 5; α(O)=3.52×10^{-7} 22 B(E2)(W.u.)=17 +24−11; B(M1)(W.u.)=0.32 +27−11 δ: from γ(θ) and γ(lin pol) in (^{18}O),4nγ).
		834.51[e] 8	<1.35	7223.89	(12)$^+$				
		1288.90[e] 21	<1.35	6769.51	(12$^+$)				
8067.4	(1)	8067.0[a] 5	100[a]	0	0$^+$	(D)[a]			
8110	1$^-$	8109.6[a] 8	100[a]	0	0$^+$	E1[a]			
8131	(1$^-$)	8131.5[a] 4	100[a]	0	0$^+$	(E1)[a]			
8144		8144[a] 2	100[a]	0	0$^+$	[a]			
8166.7	(1)	8166.3[a] 5	100[a]	0	0$^+$	(D)[a]			

From ENSDF

$^{90}_{40}$Zr$_{50}$-24

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^{π}_i	E_{γ}[†@]	I_{γ}[†]	E_f	J^{π}_f	Mult.[‡]	α	Comments
8221.2	1	8220.8[a] *8*	100[a]	0	0^+	D[a]		
8235.6	1	8235.2[a] *3*	100[a]	0	0^+	D[a]		
8250.7	1	8250.3[a] *5*	100[a]	0	0^+	D[a]		
8295.3	(1)	8294.9[a] *10*	100[a]	0	0^+	(D)[a]		
8313.0	1	8312.6[a] *7*	100[a]	0	0^+	D[a]		
8334.1	1	8333.7[a] *5*	100[a]	0	0^+	D[a]		
8357.5	1	8357.1[a] *18*	100[a]	0	0^+	D[a]		
8382.1	(1)	8381.7[a] *10*	100[a]	0	0^+	(D)[a]		
8403.7		8403.3[a] *11*	100[a]	0	0^+			
8413.5	1	8413.1[a] *4*	100[a]	0	0^+	D[a]		
8440.6	1	8440.2[a] *4*	100[a]	0	0^+	D[a]		
8467.7		8467.3[a] *15*	100[a]	0	0^+			
8501.2	1^-	8500.8[a] *4*	100[a]	0	0^+	E1[a]		
8518		8518[a] *3*	100[a]	0	0^+			
8544		8544[a] *4*	100[a]	0	0^+			
8553.5	1	8553.1[a] *12*	100[a]	0	0^+	D[a]		
8588.3	1	8587.9[a] *7*	100[a]	0	0^+	D[a]		
8598.2	1	8597.8[a] *10*	100[a]	0	0^+	D[a]		
8625.6	1	8625.2[a] *10*	100[a]	0	0^+	D[a]		
8664.1	1	8663.7[a] *5*	100[a]	0	0^+	D[a]		
8716.6	1^-	8716.1[a] *5*	100[a]	0	0^+	E1[a]		
8751.0	1	8750.5[a] *8*	100[a]	0	0^+	D[a]		
8760.4	1	8759.9[a] *5*	100[a]	0	0^+	D[a]		
8812.0	1	8811.5[a] *13*	100[a]	0	0^+	D[a]		
8833.2	1	8832.7[a] *8*	100[a]	0	0^+	D[a]		
8874.9	1	8874.4[a] *9*	100[a]	0	0^+	D[a]		
8903.0		8902.5[a] *8*	100[a]	0	0^+			
8927.4		8926.9[a] *4*	100[a]	0	0^+			
8958.13	$(15)^-$	899.71[b] *20*	100[b]	8058.41	$(14)^+$	E1[b]	3.71×10^{-4} *18*	α(K)=0.000328 *16*; α(L)=3.58×10^{-5} *18*; α(M)=6.2×10^{-6} *4*; α(N)=8.8×10^{-7} *5*; α(O)=6.2×10^{-8} *4* B(E1)(W.u.)=9×10^{-4} *+9−4*
		1520.29[b] *22*	<1[b]	7437.82	$(13)^+$			
8978.4	(1)	8977.9[a] *9*	100[a]	0	0^+	(D)[a]		
8985		8985[a] *2*	100[a]	0	0^+			
9004.7	1	9004.2[a] *5*	100[a]	0	0^+	D[a]		
9014.0		9013.5[a] *8*	100[a]	0	0^+			
9034.0		9033.5[a] *8*	100[a]	0	0^+			
9043.6	1	9043.1[a] *4*	100[a]	0	0^+	D[a]		

$^{90}_{40}Zr_{50}$-25

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
9053.5		9053.0[a] 7	100[a]	0	0^+				
9085.1	1	9084.6[a] 3	100[a]	0	0^+	D[a]			
9111.1	1	9110.6[a] 6	100[a]	0	0^+	D[a]			
9123.6		9123.1[a] 7	100[a]	0	0^+				
9137.5		9137.0[a] 7	100[a]	0	0^+				
9148.5	1^-	9148.0[a] 3	100[a]	0	0^+	E1[a]			
9164.9		9164.4[a] 7	100[a]	0	0^+				
9177.5		9177.0[a] 5	100[a]	0	0^+				
9187		9186[a] 3	100[a]	0	0^+				
9196.5	(1^-)	9196.0[a] 3	100[a]	0	0^+	(E1)[a]			
9260.5	1	9260.0[a] 6	100[a]	0	0^+	D[a]			
9292.8	1	9292.3[a] 5	100[a]	0	0^+	D[a]			
9309.4	1	9308.9[a] 7	100[a]	0	0^+	D[a]			
9333.4	1^-	9332.9[a] 6	100[a]	0	0^+	E1[a]			
9373.2		9372.8[a] 7	100[a]	0	0^+				
9392.4	1	9391.9[a] 8	100[a]	0	0^+	D[a]			
9409.4		9408.9[a] 11	100[a]	0	0^+				
9424.3		9423.8[a] 10	100[a]	0	0^+				
9444.7	1	9444.2[a] 4	100[a]	0	0^+	D[a]			
9465.1	1	9464.6[a] 5	100[a]	0	0^+	D[a]			
9486.8	1	9486.3[a] 4	100[a]	0	0^+	D[a]			
9510.5	(1)	9510.0[a] 13	100[a]	0	0^+	(D)[a]			
9524.1	1	9523.6[a] 13	100[a]	0	0^+	D[a]			
9539.2	1	9538.7[a] 5	100[a]	0	0^+	D[a]			
9551.4	1	9550.9[a] 6	100[a]	0	0^+	D[a]			
9563.0	1	9562.5[a] 6	100[a]	0	0^+	D[a]			
9609.2		9608.6[a] 7	100[a]	0	0^+				
9625.1		9624.5[a] 8	100[a]	0	0^+				
9640.4	1	9639.8[a] 8	100[a]	0	0^+	D[a]			
9666.0	(1)	9665.4[a] 8	100[a]	0	0^+	(D)[a]			
9678.3	(1^-)	9677.7[a] 7	100[a]	0	0^+	(E1)[a]			
9686.9	1	9686.3[a] 6	100[a]	0	0^+	D[a]			
9707.00?	(16^-)	748.87[be] 20	100[b]	8958.13	$(15)^-$	(M1(+E2))[b]	−0.15 15	1.27×10^{-3} 2	α(K)=0.001119 17; α(L)=0.0001234 19; α(M)=2.14×10^{-5} 4; α(N)=3.04×10^{-6} 5; α(O)=2.17×10^{-7} 4 B(E2)(W.u.)=5 +16−4; B(M1)(W.u.)=0.105 +39−26
9733.2	1	9732.6[a] 5	100[a]	0	0^+	D[a]			
9741.7		9741.1[a] 7	100[a]	0	0^+				
9754.0	1	9753.4[a] 6	100[a]	0	0^+	D[a]			

$^{90}_{40}Zr_{50}$-26

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
9784.6		9784.0[a] 5	100[a]	0	0^+				
9805.4		9804.8[a] 10	100[a]	0	0^+				
9836.01	$(15)^+$	1777.6[b] 3	100[b]	8058.41	$(14)^+$				
9843.4	1	9842.8[a] 6	100[a]	0	0^+	D[a]			
9855.5	1	9854.9[a] 8	100[a]	0	0^+	D[a]			
9872.4	1	9871.8[a] 4	100[a]	0	0^+	D[a]			
9890.7	(1)	9890.1[a] 13	100[a]	0	0^+	(D)[a]			
9901.9		9901.3[a] 13	100[a]	0	0^+				
9932.1	1	9931.5[a] 12	100[a]	0	0^+	D[a]			
9962.8	1	9962.2[a] 5	100[a]	0	0^+	D[a]			
9984.1		9983.5[a] 11	100[a]	0	0^+				
10004.2	1	10003.6[a] 10	100[a]	0	0^+	D[a]			
10019.6	1	10019.0[a] 11	100[a]	0	0^+	D[a]			
10031		10030[a] 2	100[a]	0	0^+				
10042.9	(1^-)	10042.3[a] 4	100[a]	0	0^+	(E1)[a]			
10083.8	1	10083.2[a] 6	100[a]	0	0^+	D[a]			
10094.2	1	10093.6[a] 7	100[a]	0	0^+	D[a]			
10104.9	(1)	10104.3[a] 12	100[a]	0	0^+	(D)[a]			
10123.7	1	10123.1[a] 18	100[a]	0	0^+	D[a]			
10125.84	$(16)^+$	289.83[b] 6	57.2[b] 23	9836.01	$(15)^+$	M1(+E2)[b]	−0.01 6	0.01205 18	α(K)=0.01061 16; α(L)=0.001199 19; α(M)=0.000208 4; α(N)=2.96×10^{-5} 5; α(O)=2.07×10^{-6} 3 B(M1)(W.u.)=0.54 +25−14 δ: from $\gamma(\theta)$ and γ(lin pol) in (^{18}O,4nγ).
		1167.70[b] 20	100[b] 4	8958.13	$(15)^-$	E1(+M2)[b]	−0.02 5	2.42×10^{-4} 5	α(K)=0.000191 5; α(L)=2.07×10^{-5} 5; α(M)=3.59×10^{-6} 9; α(N)=5.10×10^{-7} 12; α(O)=3.63×10^{-8} 9 B(E1)(W.u.)=2.2×10^{-4} +11−6 δ: from $\gamma(\theta)$ and γ(lin pol) in (^{18}O,4nγ).
		2067.4[b] 3	<5.1[b]	8058.41	$(14)^+$				
10146.8	1	10146.2[a] 9	100[a]	0	0^+	D[a]			
10163.4	1	10162.9[a] 8	100[a]	0	0^+	D[a]			
10193.0	1	10192.4[a] 5	100[a]	0	0^+	D[a]			
10216.8	1	10216.2[a] 10	100[a]	0	0^+	D[a]			
10233		10232[a] 4	100[a]	0	0^+				
10241	(1)	10240[a] 2	100[a]	0	0^+	(D)[a]			
10260.9		10260.3[a] 11	100[a]	0	0^+				
10270.0		10269.4[a] 7	100[a]	0	0^+				

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J_i^π	E_γ[†@]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
10286.2	1	10285.6[a] *6*	100[a]	0	0^+	D[a]	
10298.3	(1)	10297.7[a] *10*	100[a]	0	0^+	D[a]	
10306.6	1	10306.0[a] *9*	100[a]	0	0^+	D[a]	
10315.1	1	10314.5[a] *4*	100[a]	0	0^+	D[a]	
10334.9	1	10334.3[a] *6*	100[a]	0	0^+	D[a]	
10361	(1)	10360[a] *2*	100[a]	0	0^+	(D)[a]	
10376.8	1	10376.2[a] *4*	100[a]	0	0^+	D[a]	
10402.5	1	10401.9[a] *9*	100[a]	0	0^+	D[a]	
10494.5	(1)	10493.8[a] *11*	100[a]	0	0^+	(D)[a]	
10507.9	1	10507.2[a] *8*	100[a]	0	0^+	D[a]	
10524.6	1	10523.9[a] *4*	100[a]	0	0^+	D[a]	
10595.0	1	10594.3[a] *7*	100[a]	0	0^+	D[a]	
10618.7	1	10618.0[a] *8*	100[a]	0	0^+	D[a]	
10638.5	1	10637.8[a] *9*	100[a]	0	0^+	D[a]	
10682.2	1	10681.5[a] *6*	100[a]	0	0^+	D[a]	
10713.2	(1)	10712.5[a] *12*	100[a]	0	0^+	(D)[a]	
10728.2	1	10727.5[a] *11*	100[a]	0	0^+	D[a]	
10764.9	(17^+)	639.0[cb] *8*	100[b] *23*	10125.84	$(16)^+$	(M1+E2)[b]	α(K)=0.00171 *12*; α(L)=0.000192 *16*; α(M)=3.3×10^{-5} *3*; α(N)=4.7×10^{-6} *4*; α(O)=3.27×10^{-7} *18* B(E2)(W.u.)>6.7×10^{-4}; B(M1)(W.u.)>2.7×10^{-7}
		928.9[b] *7*	<5.7[b]	9836.01	$(15)^+$		
		1806.7[b] *8*	<4.5[b]	8958.13	$(15)^-$		
10827.1	1	10826.4[a] *5*	100[a]	0	0^+	D[a]	
10914	(1)	10913[a] *2*	100[a]	0	0^+	(D)[a]	
10957	1	10956[a] *2*	100[a]	0	0^+	D[a]	
10987.0	1	10986.3[a] *10*	100[a]	0	0^+	D[a]	
11044		11043[a] *2*	100[a]	0	0^+		
11094.2		11093.5[a] *15*	100[a]	0	0^+		
11108.0		11107.3[a] *16*	100[a]	0	0^+		
11120.4	1	11119.7[a] *9*	100[a]	0	0^+	D[a]	
11129.2		11128.5[a] *17*	100[a]	0	0^+		
11140		11139[a] *2*	100[a]	0	0^+		
11232.4	1	11231.6[a] *7*	100[a]	0	0^+	D[a]	
11243.2	1	11242.4[a] *6*	100[a]	0	0^+	D[a]	
11337.7	1	11336.9[a] *6*	100[a]	0	0^+	D[a]	
11403.9	(18^+)	639.0[b] *8*	1.0×10^2[b] *3*	10764.9	(17^+)	(M1+E2)[b]	α(K)=0.00171 *12*; α(L)=0.000192 *16*; α(M)=3.3×10^{-5} *3*; α(N)=4.7×10^{-6} *4*; α(O)=3.27×10^{-7} *18*

$^{90}_{40}Zr_{50}$-28

γ(^{90}Zr) (continued)

E_i(level)	J^π_i	E_γ[†@]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α	Comments
									α(K)=0.00171 *12*; α(L)=0.000192 *16*; α(M)=3.3×10^{-5} *3*; α(N)=4.7×10^{-6} *4*; α(O)=3.27×10^{-7} *18*
11403.9	(18$^+$)	1278.1[cb] *10*	<3.9[b]	10125.84	(16)$^+$				
11417.5	(1)	11416.7[a] *7*	100[a]	0	0$^+$	(D)[a]			
11452.2	1	11451.4[a] *10*	100[a]	0	0$^+$	D[a]			
11479.7	1	11478.9[a] *8*	100[a]	0	0$^+$	D[a]			
11501		11500[a] *3*	100[a]	0	0$^+$				
11510		11509[a] *7*	100[a]	0	0$^+$				
11531	1	11530[a] *2*	100[a]	0	0$^+$	D[a]			
11627.9		11627.1[a] *9*	100[a]	0	0$^+$				
11651.5	(1)	11650.7[a] *8*	100[a]	0	0$^+$	(D)[a]			
11777.4	1	11776.6[a] *10*	100[a]	0	0$^+$	D[a]			
11788	1	11787[a] *3*	100[a]	0	0$^+$	D[a]			
11963.3	(1)	11962.4[a] *18*	100[a]	0	0$^+$	(D)[a]			
11984	1	11983[a] *2*	100[a]	0	0$^+$	D[a]			
12020.6	1	12019.7[a] *8*	100[a]	0	0$^+$	D[a]			
12067.8	1	12066.9[a] *9*	100[a]	0	0$^+$	D[a]			
12110.7	(19$^+$)	706.8[b] *3*	100[b] *10*	11403.9	(18$^+$)	(M1(+E2))[b]	−0.3 *5*	0.00151 *8*	α(K)=0.00133 *7*; α(L)=0.000149 *9*; α(M)=2.59×10^{-5} *16*; α(N)=3.66×10^{-6} *21*; α(O)=2.55×10^{-7} *9* B(M1)(W.u.)=0.39 *+14−18* δ: from $\gamma(\theta)$ and γ(lin pol) in (^{18}O,4nγ).
		1345.9[b] *8*	<9.8[b]	10764.9	(17$^+$)				
12208.3	1	12207.4[a] *12*	100[a]	0	0$^+$	D[a]			
12219.6		8383[&] *6*	18	3842.34	2$^+$				
		8919[&] *6*	26	3308.10	2$^+$				
		9467[&] *6*	16	2747.875	3$^-$				
		10033[&] *6*	47	2186.273	2$^+$				
		10453[&] *6*	40	1760.74	0$^+$				
		12212[&] *6*	100	0	0$^+$				
12243.6	1	12242.7[a] *14*	100[a]	0	0$^+$	D[a]			
12496.3		12495.4[a] *18*	100[a]	0	0$^+$				
12880.3		12879.3[a] *10*	100[a]	0	0$^+$				
12964.7	(20$^+$)	854.00[b] *30*	1.0×10^2[b] *3*	12110.7	(19$^+$)				
		1560.8[b] *5*	<10.7[b]	11403.9	(18$^+$)				
13110.2	(2)$^-$	9270[&]		3842.34	2$^+$				
		9800[&]		3308.10	2$^+$				

Adopted Levels, Gammas (continued)

$\gamma(^{90}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†@]	E_f	J^π_f
13110.2	$(2)^-$	10360[&]	2747.875	3^-
		10920[&]	2186.273	2^+
		11350[&]	1760.74	0^+
		13110[&]	0	0^+

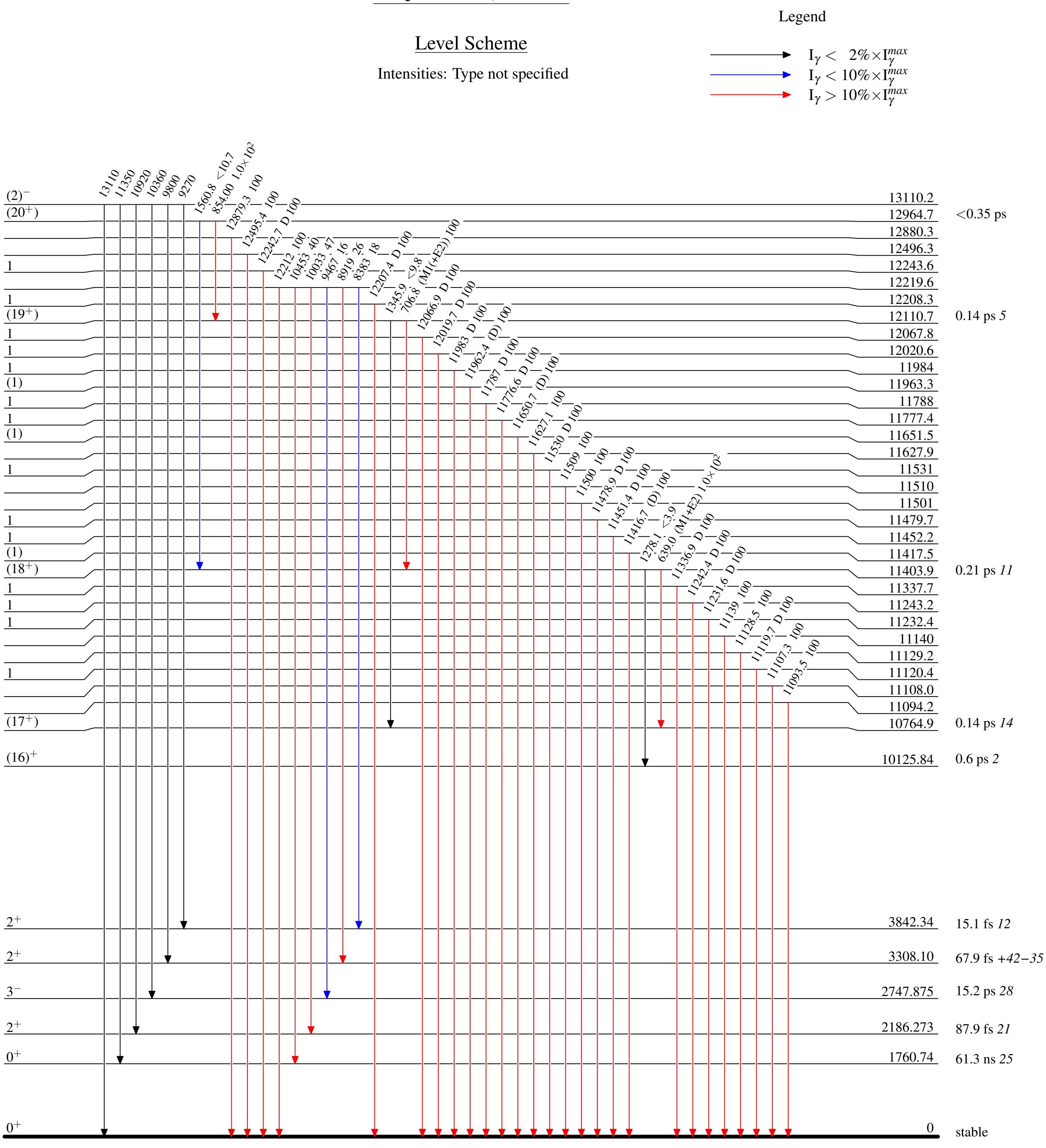
[†] From (n,n′γ), except where noted.
[‡] From $\gamma(\theta)$ in (n,n′γ) except where noted.
[#] From ^{90}Nb ε decay.
[@] From ^{89}Y(p,γ) reaction.
[&] From ^{89}Y(p,γ). From level energy difference for level 13110; not included in level energy fit.
[a] From ^{90}Zr(γ,γ').
[b] From ^{76}Ge(^{18}O,4nγ).
[c] Multiply placed.
[d] Multiply placed with undivided intensity.
[e] Placement of transition in the level scheme is uncertain.

$^{90}_{40}Zr_{50}$-30

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified



$^{90}_{40}Zr_{50}$

Adopted Levels, Gammas

Legend

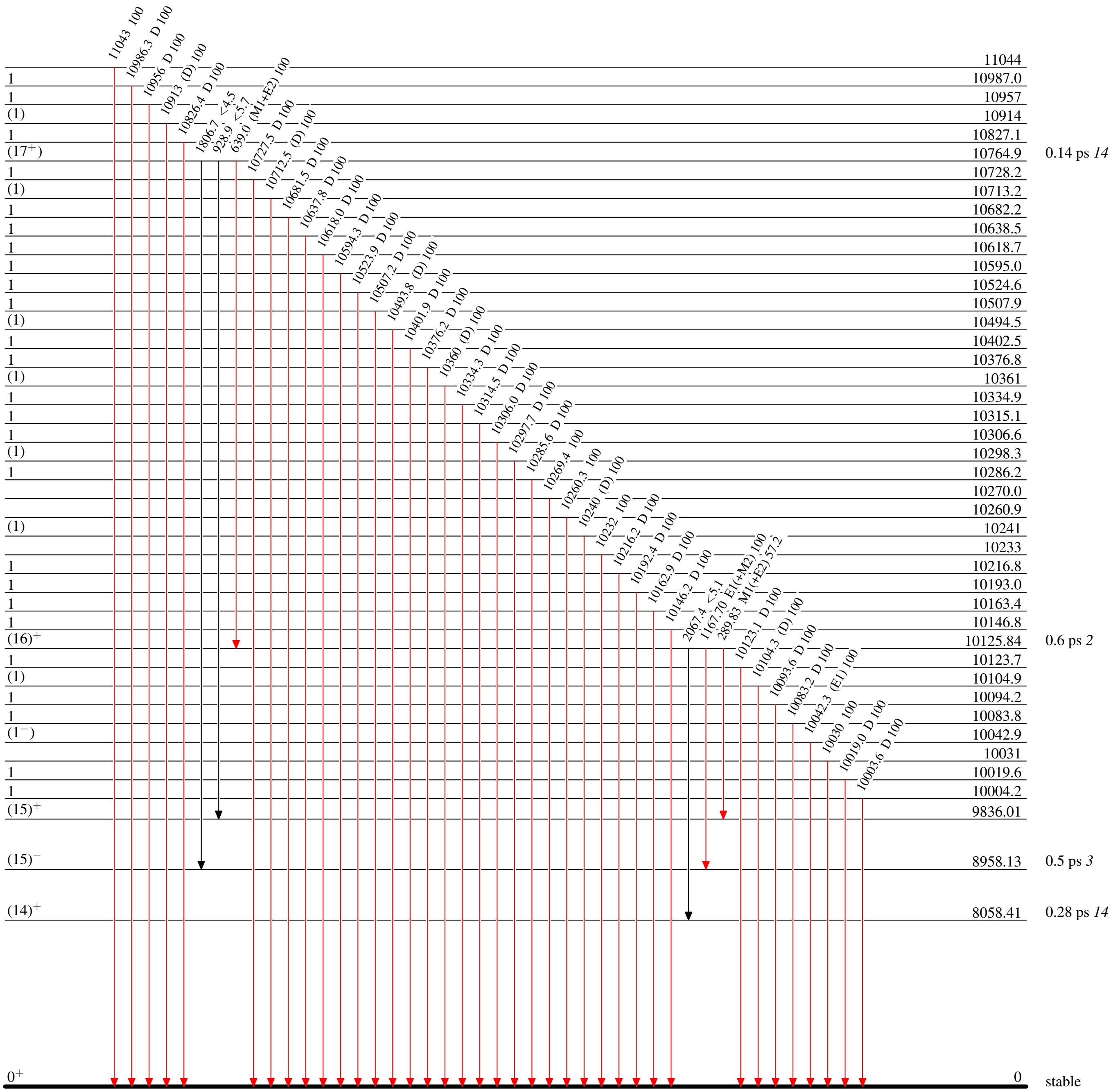
Level Scheme (continued)

Intensities: Type not specified

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

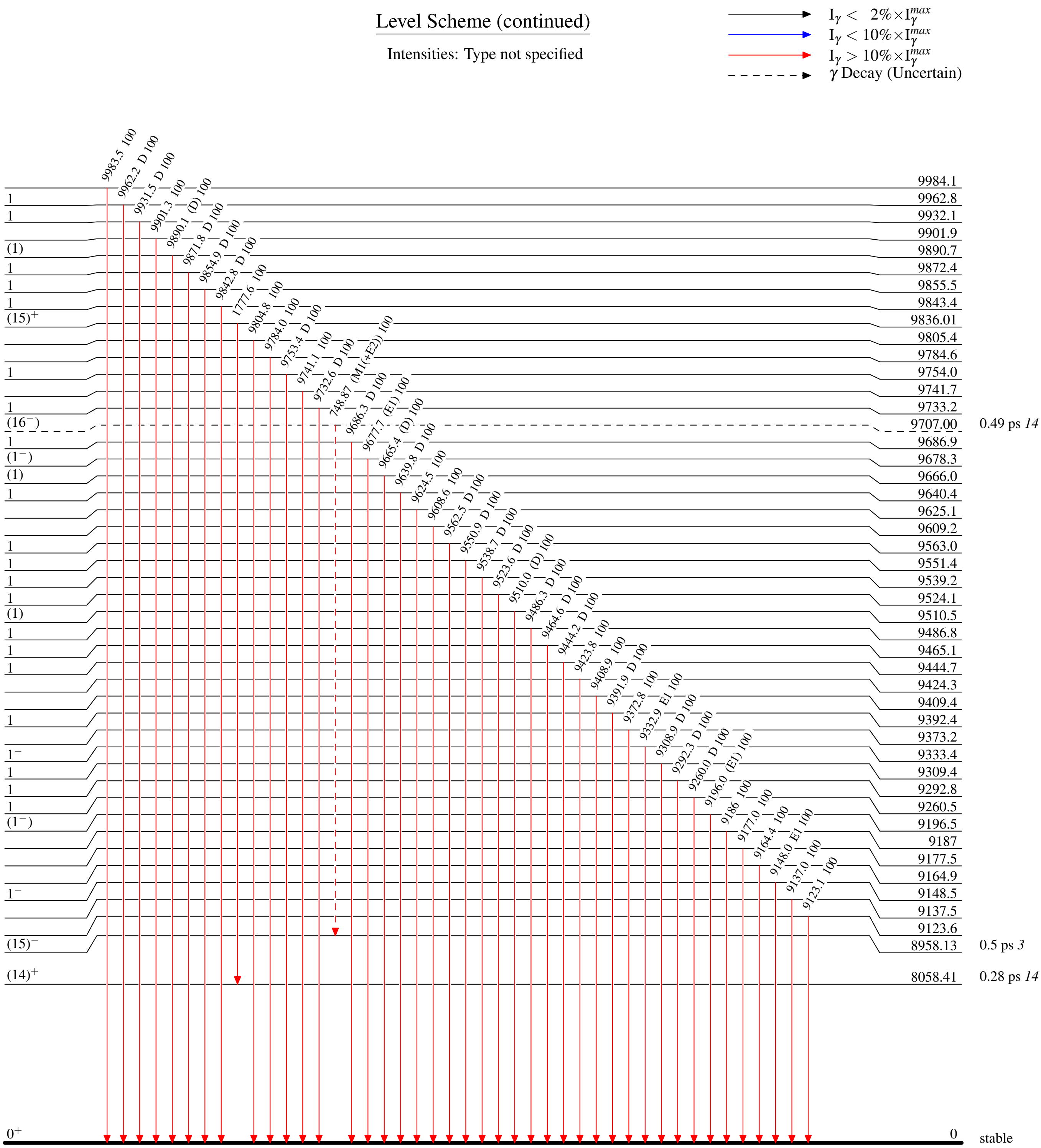


$^{90}_{40}Zr_{50}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

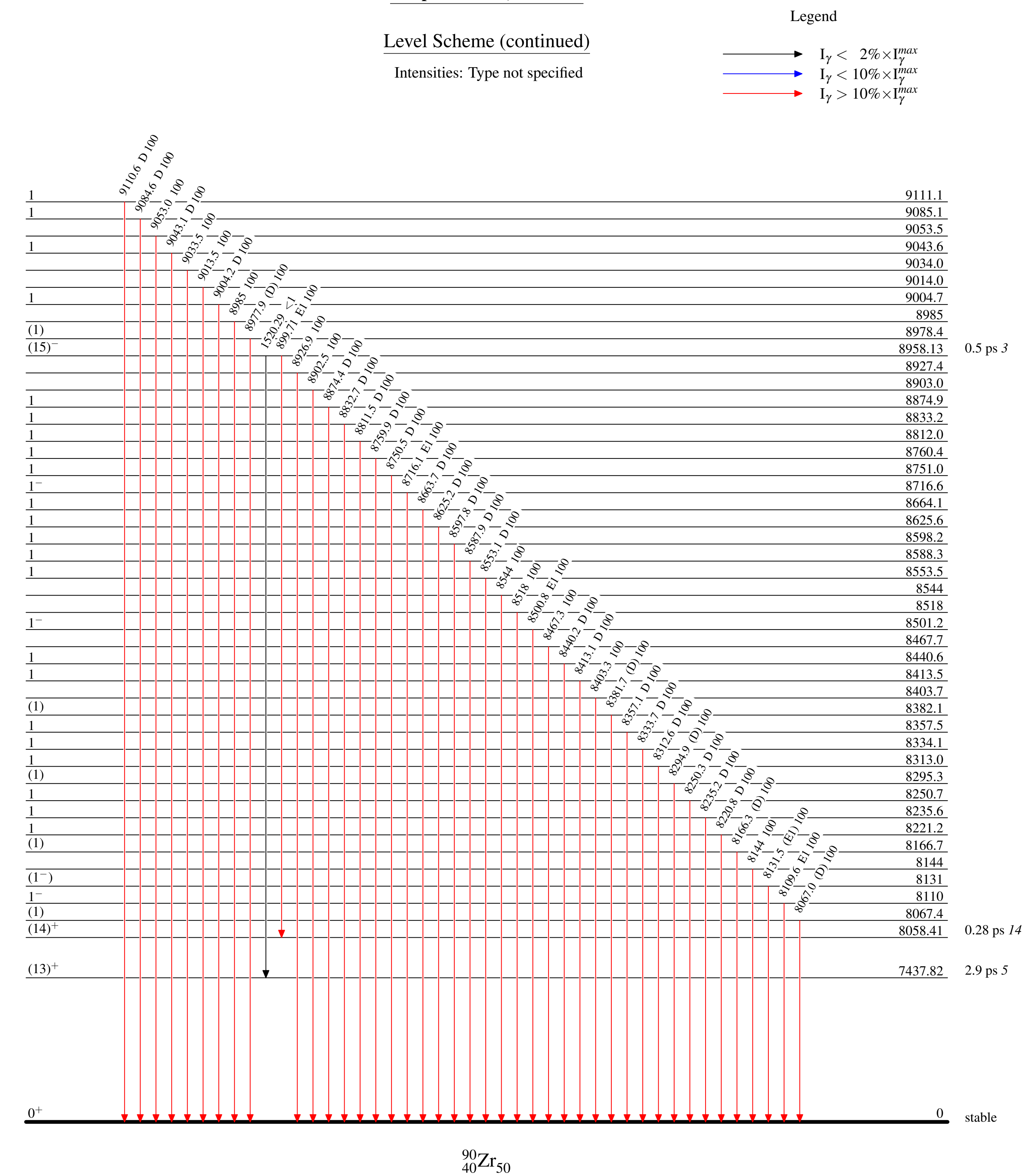


$^{90}_{40}Zr_{50}$

Adopted Levels, Gammas

Level Scheme (continued)

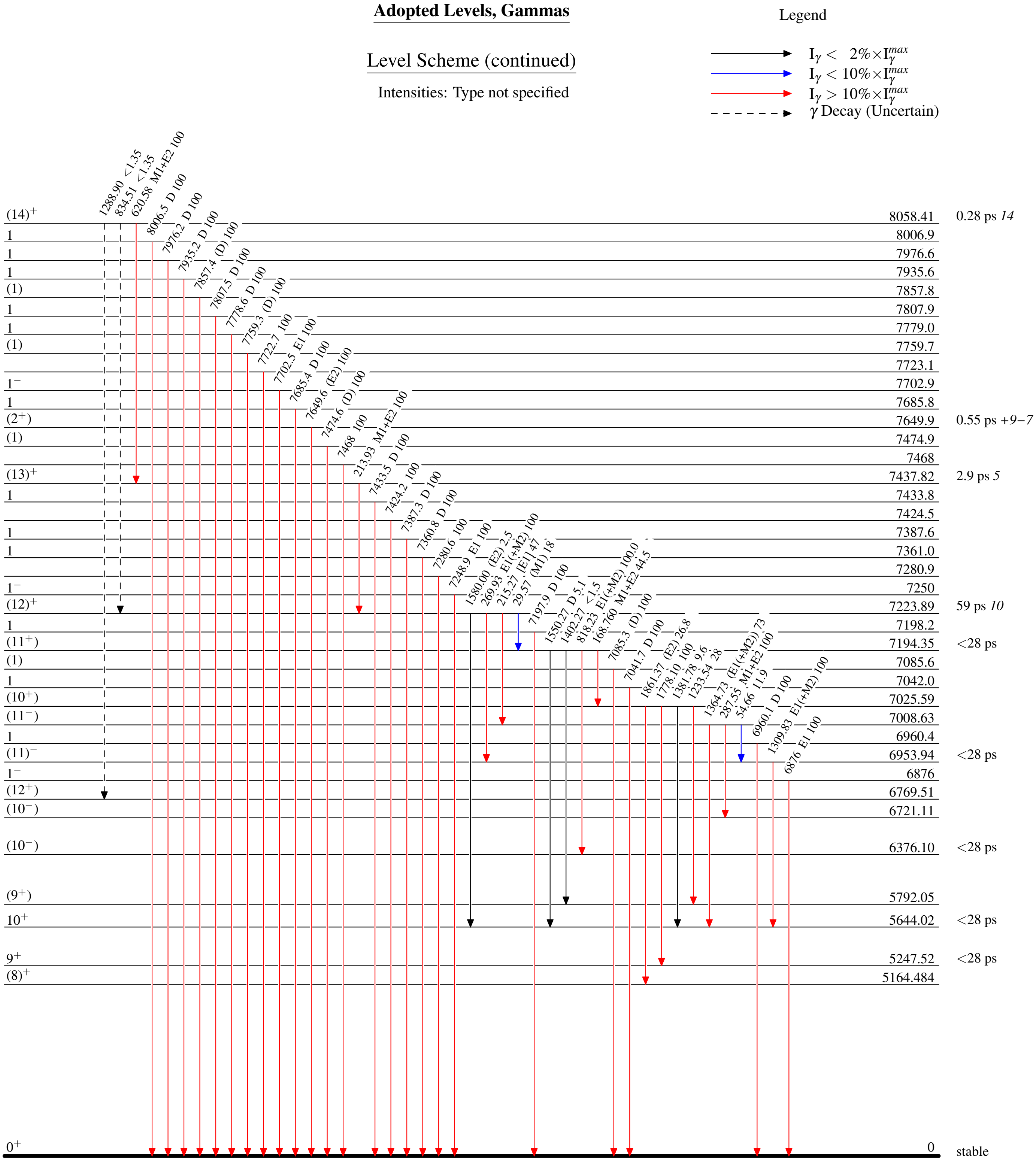
Intensities: Type not specified



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

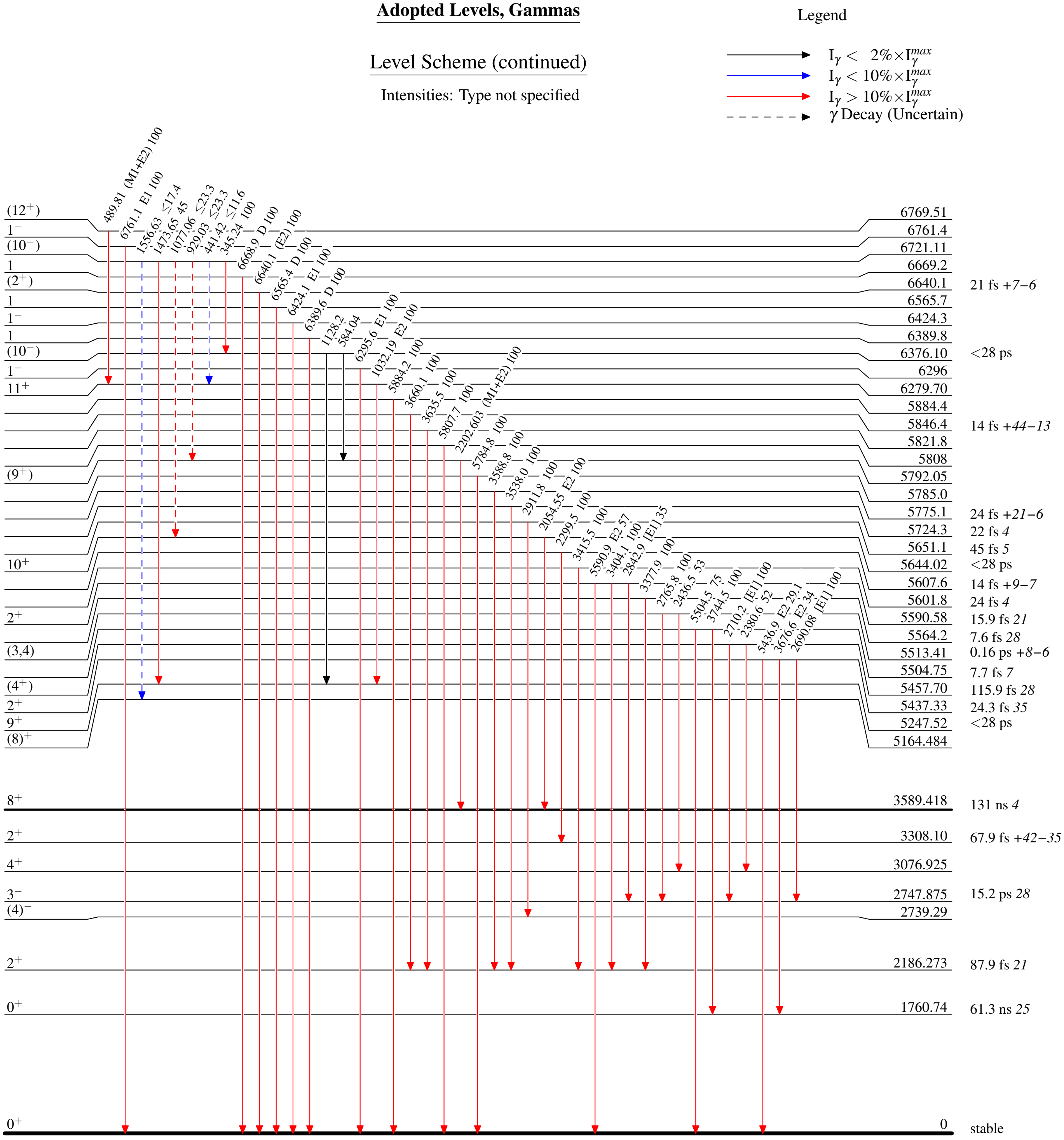


$^{90}_{40}Zr_{50}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

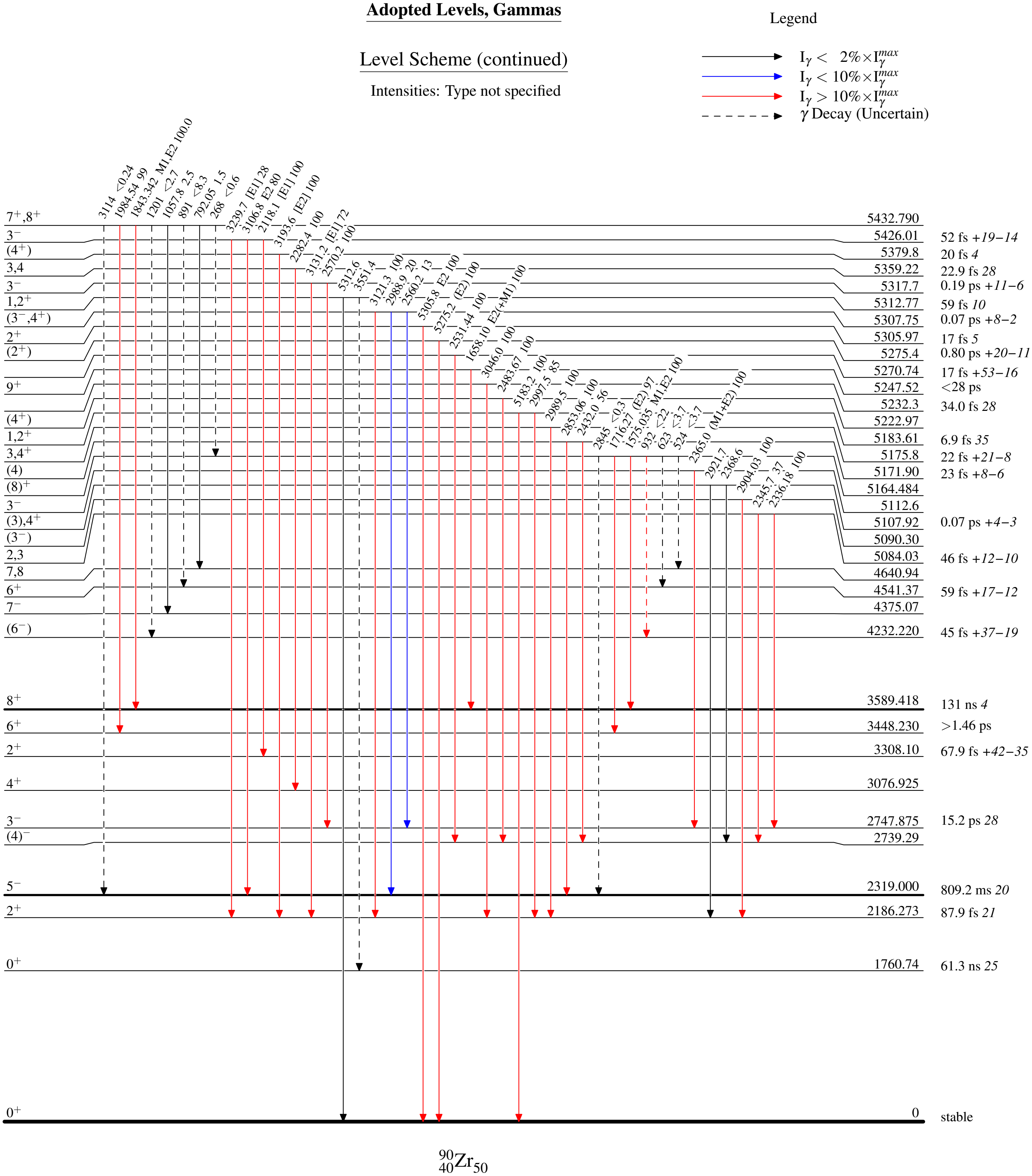


$^{90}_{40}Zr_{50}$

Adopted Levels, Gammas

Level Scheme (continued)

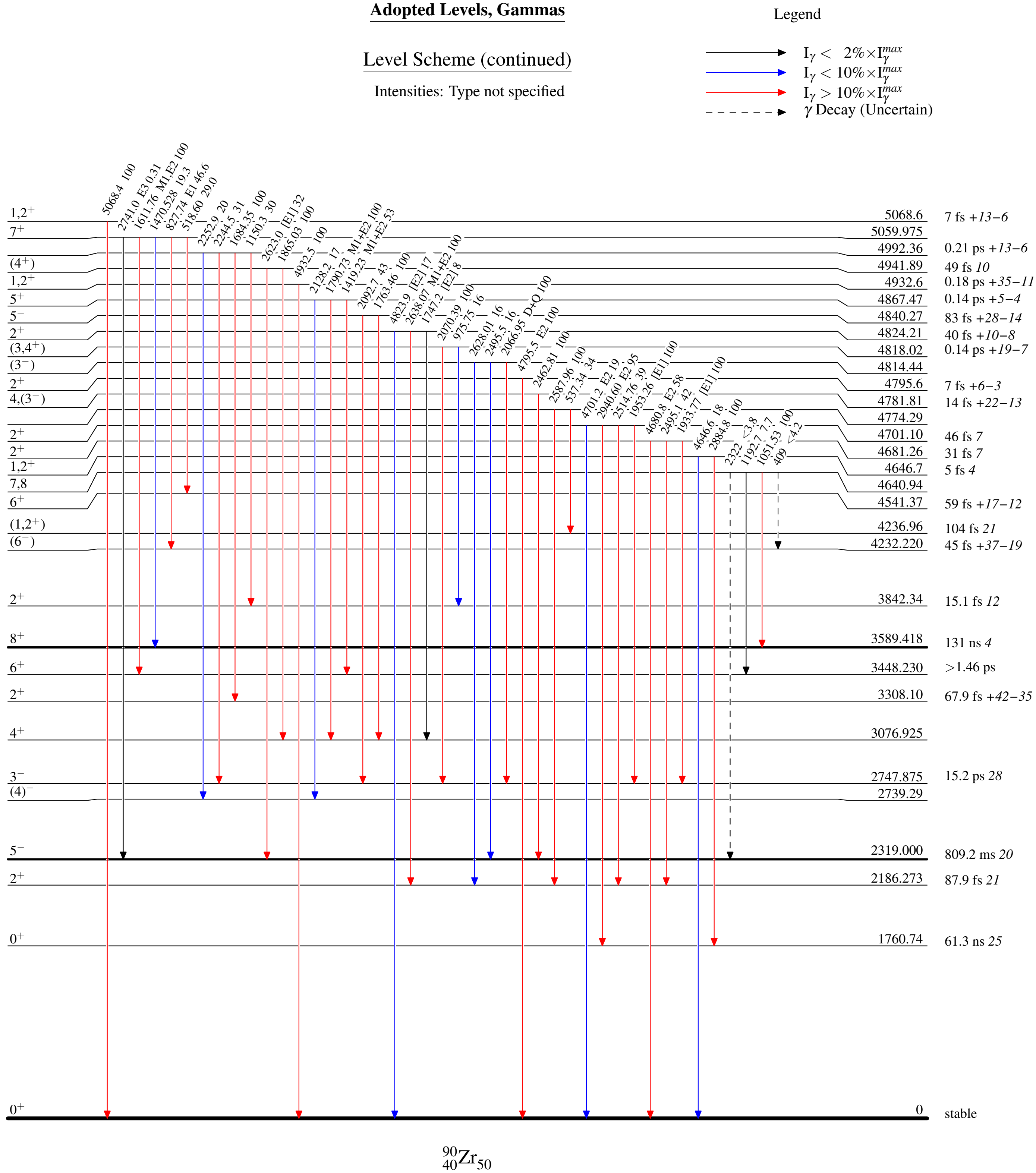
Intensities: Type not specified



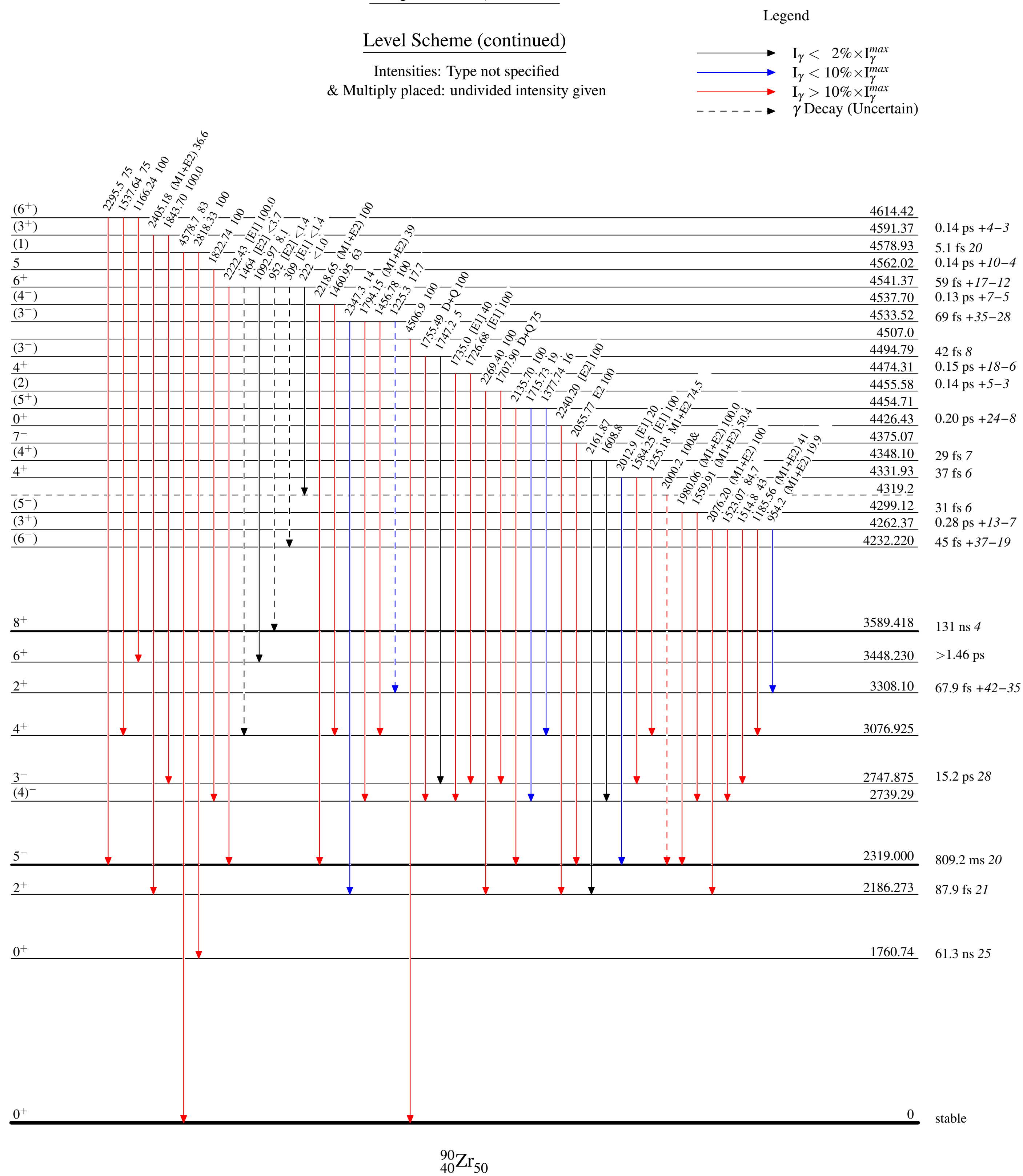
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



Adopted Levels, Gammas



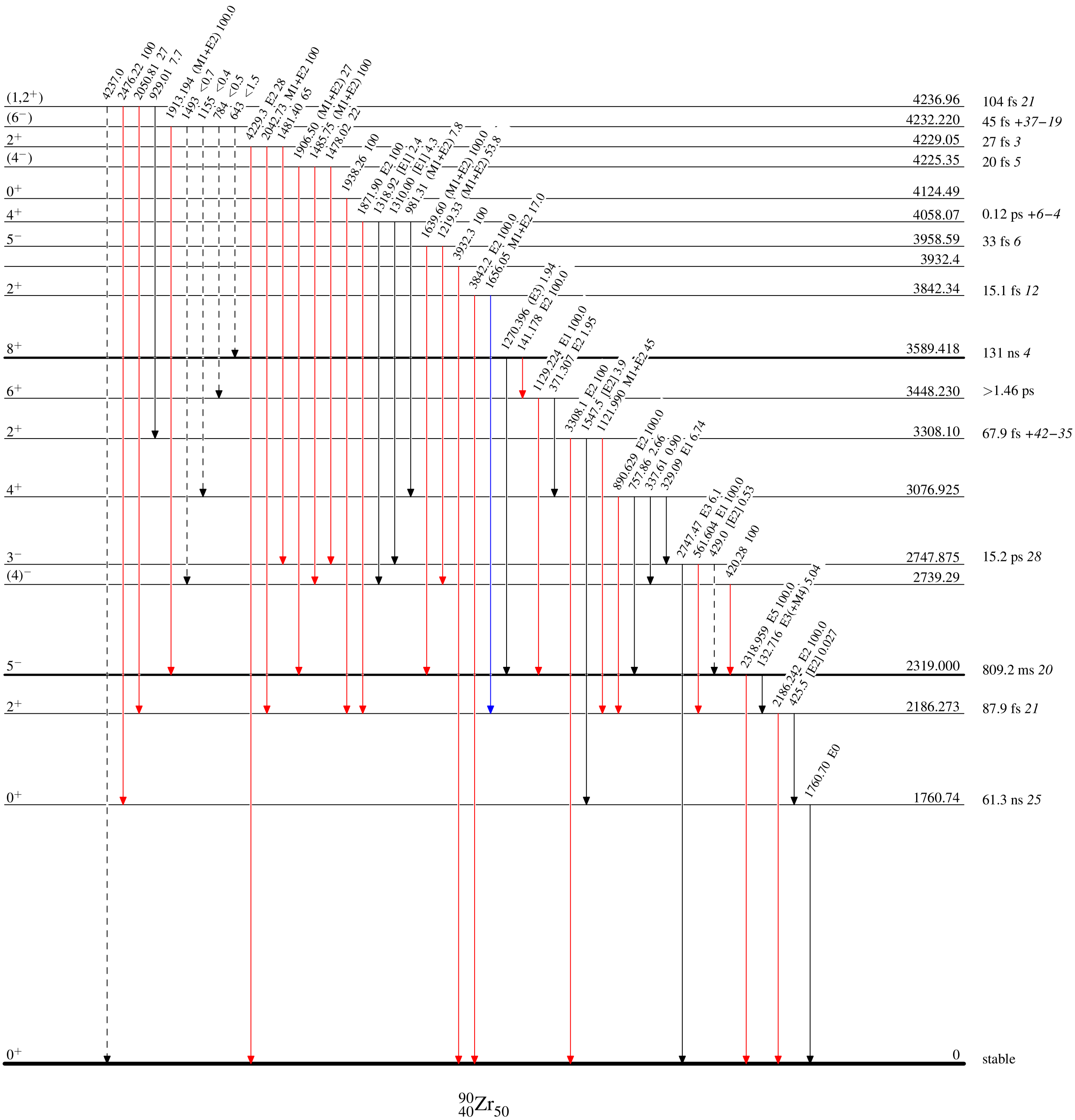
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

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)



$^{90}_{40}Zr_{50}$

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 113,2187 (2012)	15-Sep-2012

Q(β^-)=−2005.9 *18*; S(n)=8634.79 *11*; S(p)=9396.7 *19*; Q(α)=−2963.2 *21* 2012Wa38
Note: Current evaluation has used the following Q record −2005.9 18 *8634*.7911 *9396*.8 *19*−2964.3 *23* 2011AuZZ.
Q(β^-),S(n),S(p),Q(α): from 2011AuZZ; −2005.5 *18*, 8634.80 *11*, 9397.8 *18*, −2957.1 *25*, respectively, from 2003Au03.
See ^{91}Zr(n,γ) E=res for neutron resonance information; it has not been included in the present dataset.
Other Reactions:

^{9}Be(^{86}Kr,3nγ): 2007SuZN: E(^{86}Kr)=280 MeV; GEMINI-II γ detector array; measured $T_{1/2}$ using DSAM for high-spin states; data analysis not yet complete.
^{91}Zr(^{7}Li,^{6}Li): 1993Yo01: E(^{7}Li)=210 MeV, magnetic spectrograph, FWHM≈500 keV, 88.5% ^{91}Zr target; observed resonances at E=0.0 MeV (Γ=0.6 MeV), 1.3 MeV (Γ=0.9 MeV), 3.6 MeV (Γ=1.2 MeV), 4.7 MeV (Γ=0.9 MeV), 5.5 MeV (Γ=1.0 MeV), 6.8 MeV (Γ=1.6 MeV) and 15.8 MeV (Γ=6.0 MeV); interpreted these resonances as single-particle states.
^{92}Zr(^{6}Li,^{6}Li′): 1993Ho02: E(^{6}Li)=70 MeV, magnetic spectrometer, particle identification, 94.57% ^{92}Zr target, FWHM≈225 keV, θ(lab)≈4°−45°; measured $\sigma(\theta)$ for 934 and 2340 levels ($J^\pi=2^+$ and 3^-, respectively); deduced isospin character of transitions to the above two states (deformed optical model analysis). See also 1992Ho12.
For relativistic mean field calculation of g.s. properties of ^{92}Zr, see 2004He24.
For shell-model calculation of g factors and electromagnetic decay rates for lowest-energy 2^+ (934) and 3^- (2340) levels, see 2004St11.

^{92}Zr Levels

Above 3 MeV, the correspondence between levels from different reactions is sometimes ambiguous. This is due, in part, to particle reaction energy resolution being inadequate for the existing level density, but also results from particle reaction data for which the authors do not state ΔE (viz., (α,^{3}He), (p,t), (^{3}He,^{3}He′), (t,t′), (d,^{3}He)) and/or data for which the energy scale appears to include an unstated systematic uncertainty (viz.: (α,^{3}He), 10-30 keV low; (p,t), 5-10 keV low; (p,p′) from 1966St15, 10-20 keV low).
For theoretical work see, e.g., 1972Wa09, 1975Gl07, 1976Te02, 1976Pr07, 1993Ha37, 2000Ho15.

Cross Reference (XREF) Flags

A	^{92}Y β^- decay	N	^{94}Zr(p,t)	Others:	
B	^{92}Nb ε decay (10.15 d)	O	^{92}Zr(p,p′γ)	AA	^{89}Y(α,p)
C	^{48}Ca(^{48}Ca,4nγ)	P	^{92}Zr(^{3}He,^{3}He′)	AB	^{92}Zr(γ,xn), (γ,pn)
D	^{88}Sr(^{7}Li,2npγ)	Q	^{93}Nb(μ^-,nγ)	AC	^{94}Mo(^{14}C,^{16}O)
E	^{90}Zr(t,p)	R	^{93}Nb(d,^{3}He), (pol d,^{3}He)	AD	^{96}Mo(d,^{6}Li)
F	^{91}Zr(n,γ) E=thermal	S	^{94}Mo(^{6}Li,^{8}B)	AE	^{91}Zr(^{16}O,^{15}O)
G	^{91}Zr(d,p), (pol d,p)	T	^{92}Zr(^{16}O,^{16}O′), (^{18}O,^{18}O′)	AF	^{91}Zr(n,γ),(n,n) E=res
H	^{91}Zr(α,^{3}He)	U	^{92}Nb ε decay (3.47×10^{7} y)	AG	^{173}Yb(^{24}Mg,Fγ),^{176}Yb(^{28}Si,Xγ),
I	^{92}Zr(n,n′γ)	V	^{90}Zr(α,^{2}He)	AH	^{92}Zr(pol γ,γ′), (γ,γ′)
J	^{92}Zr(p,p′), (pol p,p′)	W	Coulomb excitation	AI	^{208}Pb(^{90}Zr,Xγ)
K	^{92}Zr(α,α′)	X	^{92}Zr(n,n′)	AJ	^{82}Se(^{13}C,3nγ)
L	^{92}Zr(d,d′), (pol d,d)	Y	^{95}Mo(n,α)	AK	^{92}Zr(α,α′γ)
M	^{92}Zr(t,t′)	Z	^{92}Zr(e,e′)	AL	^{91}Zr(n,γ) E=292 eV

E(level)[‡]	J^π	$T_{1/2}$[#]	XREF	Comments
0.0[b]	0^+	stable	ABCDEFGHIJKLMNOPQRSTUVWXYZ	XREF: Others: AA, AC, AD, AF, AG, AH, AI, AJ, AK, AL Δ<r^2>(92,90)=0.224 *26* (1999GaZX), 0.224 *25* (1988GaZS); Δ<r^2>(92,94)=0.170 *19* (1988GaZS). <r^2>$^{1/2}$(charge)=4.3057 fm *9* (2004An14).
934.51[b] *4*	2^+	5.0 ps *4*	ABCDEFGHIJKLMNOPQRSTU WXYZ	XREF: Others: AA, AC, AD, AF, AG, AI, AJ, AK, AL

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)‡	J^π	$T_{1/2}$#	XREF	Comments
				μ=−0.360 *20* (1999Ja13) J^π: L=2 in (t,p), (p,t) and p,d,t,^{3}He,α scattering. μ implies dominant role of $d_{5/2}$ neutrons in wavefunction of this state (1999Ja13). $T_{1/2}$: from B(E2)=0.080 *6* (Coulomb excitation). μ: from measured g-factor=−0.180 *10* from $\gamma(\theta$,H,t) in Coulomb excitation. Other μ: −0.06 *10* from transient field integral PAC (1989Ra17, from 1980Ha31), assuming $T_{1/2}$=4.85 ps; −0.36 *4* (2008We07; transient field).
1382.77 *7*	0^+	88 ps *3*	A EFG IJ L NO QRS WX	XREF: Others: AA, AC, AD, AH J^π: 448γ-934$\gamma(\theta)$ in ^{92}Y β^- decay indicates a 0-2-0 cascade; L=0 in (t,p) and (p,t). $T_{1/2}$: from ^{92}Y β^- decay. Other: 85 ps *15* from (p,p′γ).
1495.46[b] *5*	4^+	102 ps *3*	A CDEFGHIJKLMN PQ STUVWX	XREF: Others: AA, AC, AD, AF, AG, AH, AI, AJ, AK, AL μ=−2.0 *4* (1999Ja13) μ: from measured g-factor=−0.50 *11* from $\gamma(\theta$,H,t) in Coulomb excitation. J^π: L=4 in (t,p), (p,t), (p,p′), (t,t′), (α,α'). μ implies dominant role of $d_{5/2}$ neutrons in wavefunction of this state (1999Ja13). $T_{1/2}$: from $\gamma\gamma$(t), ^{92}Y β^- decay.
1847.27 *4*	2^+	96[&] fs *10*	AB EFGHIJKLMN P R T WX Z	XREF: Others: AA, AC, AD, AF, AH μ=+1.5 *10* (2008We07) J^π: L=2 in (p,t), (p,p′), (t,t′), (α,α'), (^{3}He,^{3}He′), (t,p). μ: From measured g-factor in Coulomb excitation (transient field). Level exhibits structure expected for a mixed symmetry one-phonon Q excitation (2002We15).
2066.65 *5*	2^+	>0.76[&] ps	AB EFGHIJKLM WX	XREF: Others: AC, AD, AF, AL J^π: L=2 in (t,p), (p,p′), (α,α').
2182 *10*	(2^+)		K	J^π: L(α,α')=(2). Probably same level as in (p,p′) at E=2180? 22.
2339.66 *4*	3^-	0.28[&] ps *3*	A EFGHIJKLMN P R T VWX	XREF: Others: AD, AL J^π: L=3 in (t,p), (p,t), (p,p′), (d,d′), (t,t′), (^{3}He,^{3}He′), (α,α'). For summary of B(E3)↑ data, see 1989Sp01; recommended value is 0.067 *22* based on b_3 from angular distribution in (p,p′). This corresponds to 4.4% *15* of energy-weighted E3 sum rule.
2398.36 *6*	4^+	149[&] fs *16*	EFGHI K N WX	XREF: Others: AB, AD, AF, AG XREF: X(2360). J^π: L=4 in (t,p) and (α,α'). Note: evaluator assumes J=1,3 from (n,n′) for 2360 *20* level to be in error; alternatively, an additional level may exist at that energy.
2473.4? *5*	(≤2)		A	J^π: γ ray to 0^+ state.
2486.01 *9*	5^-	≤3.5 ns	DEF IJKL N R WX	XREF: Others: AB, AC, AD, AE, AG XREF: R(2450). J^π: L=5 in (t,p), (p,p′), (α,α') and analyzing power in (pol p,p′) (1979De11). See comment on J(2486 level) in (n,γ).

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Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)[‡]	J^π	$T_{1/2}$[#]	XREF	Comments
2666 *30*			J X	XREF: Others: AA, AB, AE, AF XREF: J(2651). Excitation of level in (p,p′) is not certain.
2743.55 *7*	4^-	>2.63[&] ps	F I R	J^π: D(+Q) 404γ and 258γ to 3^- 2340 and 5^- 2486, respectively; L(d,^{3}He)=1. If the 2486 and 2744 states are treated as members of the ($p_{1/2}$,$g_{9/2}$) doublet, they exhaust the $p_{1/2}$ pickup strength in (d,^{3}He).
2752?[†] *11*	3^-		KLM x	XREF: Others: AB, AG, AH XREF: x(2778). J^π: L(α,α′)=3.
2819.54 *7*	2^+	64[&] fs *7*	A EFG IJK x	XREF: Others: AB, AG, AH XREF: x(2778). J^π: L=2 in (t,p), (α,α′).
2864.66 *9*	4^+	0.24[&] ps *3*	E G IJKLM X	XREF: Others: AB, AD, AE, AF XREF: J(2650). J^π: L=4 in (t,p), (α,α′); however, if reported L(p,p′)=(2) is correct, a (2^+) level also must exist at approximately this energy.
2904.08 *18*	0^+	0.83[&] ps *+57−24*	EF I	J^π: L=0 in (t,p).
2909.43 *7*	3^+	216[&] fs *24*	FG I X	J^π: L=0 in (d,p) on 5/2$^+$ target; D+Q 1414γ to 4^+ 1495.
2957.4[b] *3*	6^+	≤3.5 ns	CDE GH JK	XREF: Others: AB, AC, AG, AI, AJ XREF: H(2944). J^π: L(t,p)=6; supported by L(α,α′)=(6) and (Q) 1462γ to 4^+ 1495.
3039.70 *6*	3	91[&] fs *10*	A EF I lm x	XREF: Others: AC, AD, AF, AL XREF: l(3040)m(3040)x(3063). J^π: D(+Q) 2105γ to 2^+ 934; D(+Q) 700γ to 3^- 2340; 296γ to 4^- 2744; J=3 from 700γ(θ) in (n,n′γ).
3057.40 *13*	2^+	98[&] fs *10*	E G IJKlm x	XREF: Others: AC, AD, AF XREF: J(3040)l(3040)m(3040)x(3063). J^π: L=2 in (t,p), (α,α′).
3124.61 *11*	$1^{(+)}$	58[&] fs *6*	G I	XREF: Others: AA, AB, AD, AF XREF: G(3126). J^π: D 3125γ to 0^+ g.s.; L(d,p)=2 for 5/2$^+$ target and uncertain state.
3178.31 *11*	4^+	54[&] fs *6*	F IjK M x	XREF: Others: AA, AC, AD, AG, AH XREF: j(3180)K(3187)M(3140)x(3187). J^π: L=4 in (t,t′), (α,α′). E(level): if (α,α′), (t,t′) and (n,n′γ) excite same level.
3190.99 *21*	(4^-)	153[&] fs *18*	GhIj x	XREF: Others: AA, AB, AD, AE, AG, AH XREF: h(3215)j(3180)x(3187). J^π: L(d,p)=(3+5) for 5/2$^+$ target; D(+Q) 1696γ to 4^+ 1496, but J=5 requires δ(D,Q)=+0.36 *5* and J=3 requires δ=−0.41 to −1.92 to 4^+ level, violating RUL if π=−. E(level),J^π: if (d,p), (α,^{3}He) and (n,n′γ) excite same state.
3236.9 *6*	4^+		E Gh JKl	XREF: Others: AA, AB, AD, AE

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)[‡]	J^π	$T_{1/2}$[#]	XREF	Comments
				XREF: h(3215)l(3250). J^π: L=4 in (p,p′), (α,α′).
3262.62 *4*	2$^+$	12.5[&] fs *14*	A FGHI klM x	XREF: Others: AB, AC, AD, AE, AG, AH XREF: k(3273)l(3250)M(3240)x(3275). J^π: L=0+2 in (d,p); E2 3263γ to 0$^+$ g.s.
3275.76 *8*	2$^+$,3$^+$	53[&] fs *6*	F I k x	XREF: Others: AB, AD, AE, AG XREF: k(3273)x(3275). J^π: M1+E2 2341γ to 2$^+$ 934; D,Q 878γ to 4$^+$ 2398.
3289.13 *7*	3$^+$	174[&] fs *19*	FG I k x	XREF: Others: AB, AD, AE, AG XREF: k(3273)x(3275). J^π: L=0 in (d,p); M1+E2 2355γ to 2$^+$ 934; M1+E2 1794γ to 4$^+$ 1496.
3304 *10*	6$^+$		E m	XREF: Others: AB, AD XREF: m(3320). J^π: L=6 in (t,p).
3308.7[b] *4*	(8$^+$)	1.18 ns *7*	CD m r	XREF: Others: AA, AB, AD, AG, AI, AJ XREF: m(3320)r(3310). J^π: stretched Q transition to 6$^+$ 2958 in (^{7}Li,2npγ). $T_{1/2}$: from recoil-distance measurements in ^{48}Ca(^{48}Ca,4nγ).
3325? *8*	($^+$)		Gh j m r	XREF: Others: AA, AB, AD, AG XREF: h(3327)j(3320)m(3320)r(3310). J^π: L=(4) in (d,p). E(level): existence of level based on uncertain level in (d,p).
3345 *20*	5$^-$		h jK m	XREF: Others: AB, AD, AG XREF: h(3327)j(3320)m(3320). J^π: L=5 in (α,α′).
3371.48 *8*	1$^{(-)}$	27[&] fs *3*	A EFg I	XREF: Others: AC, AD, AG, AH XREF: g(3374). J^π: L=(1) in (t,p); D 3371γ to 0$^+$ g.s.
3379.8 *10*	(7$^-$)	≤3.5 ns	D	XREF: Others: AG J^π: γ to 5$^-$ in (^{7}Li,2npγ) and ^{173}Yb(^{24}Mg,Fγ).
3382 *20*	3$^-$		g K n	XREF: Others: AA, AC, AD, AG XREF: g(3374)n(3410). J^π: L=3 in (α,α′).
3407.83 *17*	2$^-$,3$^-$	0.30[&] ps *4*	I n	XREF: Others: AA, AC, AD XREF: n(3410). J^π: M1+E2 1068γ to 3$^-$ 2340; D(+Q) 2473γ to 2$^+$ 934; δ to 3$^-$ is ≥0.3 if J=2.
3446 *14*	3$^-$		jKLm	XREF: Others: AC, AD XREF: j(3440)m(3440). J^π: L=3 in (α,α′).
3452.17 *7*	(2)$^+$	58[&] fs *6*	F Ij	XREF: Others: AC, AD XREF: j(3440). J^π: M1+E2 2518γ to 2$^+$ 934; 1113γ to 3$^-$ 2340; 2070γ to 0$^+$ 1383.
3463.04 *15*	(4)$^+$	137[&] fs *+21−17*	E Ij m	XREF: Others: AA, AC, AD, AE XREF: E(3451)j(3440)m(3440). E(level): values from (p,p′) (1966St15) and E(t,p) are, respectively, 10-20 keV and 5-10 keV low. J^π: E2(+M3) 2529γ to 2$^+$ 934; L(t,p)=(4); 1968γ to 4$^+$ 1495.

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Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)‡	J^{π}	$T_{1/2}$#	XREF	Comments
3471.88 16	1^+	5.3& fs 6	FGhI	XREF: Others: AC, AD, AF, AG, AH, AI XREF: G(3469)h(3479). J^{π}: L(d,p)=2 for 5/2$^+$ target; M1 3471γ to 0$^+$ g.s.
3491 20	(3^-)		K v	XREF: Others: AC, AD, AE XREF: v(3540). J^{π}: L=(3) in (α,α').
3499.88 10	2^+	53& fs 5	EF h v	XREF: Others: AC, AD, AE, AG, AH, AI XREF: h(3479)v(3540). L=2 in (t,p).
3589 10	0^+		E k v	XREF: Others: AC, AD, AE, AG, AH XREF: k(3587)v(3540). J^{π}: L(t,p)=0+(5) for 3589+3602 doublet.
3602 9	(5^-)		E Gh k M	XREF: Others: AB, AD, AE, AF, AG, AH, AI XREF: h(3597)k(3587)M(3620). J^{π}: L(t,p)=0+(5) for 3589+3602 doublet; L(d,p)=(3+5) for 5/2$^+$ target; L=(5) in (t,t$'$).
3609.5 4	(0^+)	151& fs +26−23	I	2675γ to 2$^+$ 934; J=(0) from excit in (n,n$'\gamma$).
3628.33 7	(4^+)	26& fs 3	EF hIjk	XREF: Others: AC, AD, AE, AF, AG, AI XREF: h(3597)j(3640). 2694γ to 2$^+$ 934; 885γ to 4$^-$ 2744; 2133γ to 4$^+$ 1495; L(t,p)=2+(4) for 3628+3640 doublet so this is presumed to be the L=(4) component.
3638.2 3	1^-	8.4& fs 11	Ijk	XREF: Others: AB, AC, AD, AF, AH XREF: j(3620)k(3634). J^{π}: E1 3638γ to 0$^+$ g.s.
3640.28 11	$(2)^+$	128& fs 15	EF hIjk	XREF: Others: AB, AC, AD, AE, AF, AG, AI XREF: h(3597)j(3620)k(3634). J^{π}: M1+E2 2706γ to 2$^+$ 934; 1301γ to 3$^-$ 2340; L(t,p)=2+(4) for 3628+3640 doublet, with L=(4) component associated with 3628 level on basis of that level's γ decay.
3649.22 12	3^+	56& fs 7	FGhI L X	XREF: Others: AD, AE, AG, AI XREF: h(3597). J^{π}: M1+E2 2714γ to 2$^+$ 934; M1+E2 2154γ to 4$^+$ 1495. and 5$^-$ levels; L(d,p)=2+4 for 5/2$^+$ target.
3667.1 10	1			XREF: Others: AH J^{π},E(level): from (γ,γ').
3675.8 4	$3^+,4^+,5^+$	116& fs +24−20	I	J^{π}: M1+E2 2180γ to 4$^+$ 1495.
3696.8 4	$1^{(+)}$	17.3& fs 28	I	XREF: Others: AH J^{π}: D 3697γ to 0$^+$ g.s.; D+Q, $\Delta\pi$=(no) 2762γ to 2$^+$ 934.
3704 7	$(4)^+$		E Gh k	XREF: Others: AA, AD, AF, AG, AH XREF: h(3683)k(3711). J^{π}: L(t,p)=(4); L(d,p)=2 for 5/2$^+$ target.
3725 9	$^+$		Gh k	XREF: Others: AA, AD, AF, AG, AH XREF: h(3683)k(3711). J^{π}: L(d,p)=2 for 5/2$^+$ target.
3760 10	2^+		E h	XREF: Others: AD, AF, AH XREF: h(3683). J^{π}: L(t,p)=2.
3767 20	5^-		K	J^{π}: L(α,α')=5.
3774.6 3	$(1,2^+)$	17& fs 5	I	J^{π}: 3775γ not M2 to 0$^+$ g.s.; 2840γ to 2$^+$ 934.
3783 7	$(4)^+$		E Gh	XREF: Others: AD, AF, AH

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)[‡]	J^π	$T_{1/2}$[#]	XREF	Comments
				XREF: h(3683). J^π: L(d,p)=2 for 5/2$^+$ target; L(t,p)=(4).
3804.7 *5*	(≤4)	9[&] fs *+6−5*	I	E(level),J^π: may be the same level as 3814 in (d,p) with J^π=(1,2,3,4)$^{(+)}$. 2870γ to 2$^+$ 934.
3814 *10*	(4)$^+$		Gh N	XREF: Others: AB, AD, AH XREF: h(3802). J^π: L(d,p)=2 for 5/2$^+$ target; L(p,t)=(4).
3819.4 *12*	(8$^-$)	≤3.5 ns	D	XREF: Others: AG J^π: D ΔJ=1 440γ to (7$^-$) 3380 in (^{7}Li,2npγ).
3830.31 *9*	(1$^-$,2$^+$)		F hI K	XREF: Others: AB, AD, AH XREF: h(3802). J^π: 2447γ to 0$^+$ 1383; 1490γ to 3$^-$ 2340.
3891 *10*			Gh Jkl	XREF: Others: AB, AD, AG, AH, AI XREF: h(3802)J(3870)k(3877)l(3900). J^π: L(α,α′)=4 for one or both of 3891 and 3902 levels.
3902 *10*			E G kl	XREF: Others: AD, AG, AH, AI XREF: k(3877)l(3900). J^π: L(α,α′)=4 for one or both of 3891 and 3902 levels.
3915 *1*	1			XREF: Others: AH J^π,E(level): from (γ,γ′); D 3915γ to 0$^+$ g.s.
3944 *20*	5$^-$		H jK r	XREF: Others: AC, AD, AI XREF: H(3909)j(3940)r(3940). J^π: L(α,α′)=5.
3971 *10*			G j n r	XREF: Others: AC, AD, AI XREF: j(3940)n(3990)r(3940). J^π: L(d,p)=2 on 5/2$^+$ target for 3971+3983 doublet.
3983 *10*			G jk n	XREF: Others: AC, AD, AI XREF: j(3990)k(4003)n(3990). J^π: L(d,p)=2 on 5/2$^+$ target for 3971+3983 doublet. E(level): doublet reported in (d,p).
3992 *10*	0$^+$		E jk	XREF: Others: AC, AD XREF: k(4003). J^π: L(t,p)=0+(2).
3998.7? *12*	(9$^-$)	≤3.5 ns	D	XREF: Others: AG J^π: crossover 619γ to (7$^-$) 3380 in (^{24}Mg,Fγ); D ΔJ=1 179γ to (8$^-$) 3819 in ^{88}Sr(^{7}Li,2npγ).
4012 *10*	$^+$		E Gh k	XREF: Others: AC, AD, AH, AI XREF: h(3998)k(4003). J^π: L(d,p)=2 for 5/2$^+$ target.
4040 *7*	4$^+$		E Gh JKL	XREF: Others: AA, AB, AC, AD, AH, AI XREF: E(4031)h(3998)J(4020). E(level): (p,p′) datum excluded from weighted average. J^π: L=4 in (α,α′) and (t,p).
4082 *7*	4$^+$		E G K	XREF: Others: AA, AC, AD, AG, AI XREF: E(4071)G(4093). J^π: L=4 in (t,p), (α,α′).
4142 *10*	2$^+$,3$^+$		Gh	XREF: Others: AA, AC, AE, AI XREF: h(4159). J^π: L(d,p)=0+2 for 5/2$^+$ target.
4161 *10*	4$^+$		E h J	XREF: Others: AA, AC, AE, AI XREF: h(4159)J(4150). E(level): from (t,p). J^π: L(t,p)=4.
4181 *20*	3$^-$		K	J^π: L(α,α′)=3.
4183 *10*	($^+$)		Gh	XREF: Others: AA, AC, AE, AI

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Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)‡	J^π	$T_{1/2}$#	XREF	Comments
				XREF: h(4159). J^π: L(d,p)=(2+4) for $5/2^+$ target.
4213 *11*	$2^+,3^+$		Gh	XREF: Others: AA, AC, AE, AI XREF: h(4159). J^π: L(d,p)=0+(2) for $5/2^+$ target.
4256 *10*	4^+		G K	J^π: L(α,α')=4.
4270	(5^-)		N r	XREF: Others: AB, AC, AH XREF: r(4280). J^π: L(p,t)=(5).
4283 *10*	0^+		E r	XREF: Others: AB, AC, AH XREF: r(4280). J^π: L(t,p)=0.
4296.6[b] *4*	(10^+)	≤3.5 ns	CD	XREF: Others: AG, AI, AJ J^π: stretched (Q) 988γ to (8^+) 3309 in (^{7}Li,2npγ).
4332 *10*	2^+		E JK	XREF: Others: AA, AB, AC, AD, AF XREF: E(4332)J(4300)K(4316). E(level): from (t,p); may be 5-10 keV low. J^π: L(t,p)=2.
4380	(4^+)		N	J^π: L(p,t)=(4).
4397 *20*	2^+		K	J^π: L=2 in (α,α').
4453 *11*	$(2)^+$		Gh jkl	XREF: Others: AC, AD, AF XREF: h(4430)j(4430)l(4460). E(level): from (d,p). J^π: L=(2) for (p,p$'$) doublet; L(d,p)=2 for doublet for $5/2^+$ target.
4465 *11*	4^+		Gh jkl	XREF: Others: AC, AD, AF XREF: h(4430)j(4430)l(4460). E(level): from (d,p). J^π: L(α,α')=4; L(d,p)=2 for doublet.
4494 *11*			G	J^π: L(d,p)=2 for 4494+4504 doublet.
4504 *11*			G	J^π: L(d,p)=2 for 4494+4504 doublet.
4539 *20*	3^-		K	J^π: L=3 in (α,α').
4604 *12*	$+$		GH	J^π: L(d,p)=2 for $5/2^+$ target.
4606 *20*	(5^-)		K	J^π: L=(5) in (α,α').
4640 *12*	$-$		G	J^π: L=3 in (d,p) for $5/2^+$ target.
4670 *12*	$+$		G	J^π: L(d,p)=2 for $5/2^+$ target.
4720 *10*	$(2^+,3^+)$		G JK	J^π: L(d,p)=(0+4) for $5/2^+$ target.
4785 *10*	$(2^+,3^+)$		Gh K	XREF: Others: AC, AG, AH XREF: h(4788). J^π: L(d,p)=(0+2+4) for $5/2^+$ target.
4807 *20*	(3^-)		h Kl	XREF: Others: AA, AC, AG, AH XREF: h(4788)l(4810). J^π: L=(3) in (α,α').
4813 *12*			Gh l	XREF: Others: AA, AC, AG, AH XREF: h(4788)l(4810). J^π: L(d,p)=(2+4) for 4813+4821 doublet.
4821 *12*			Gh kl	XREF: Others: AA, AC, AD, AG, AH XREF: h(4788)k(4837)l(4810). J^π: L(d,p)=(2+4) for 4813+4821 doublet.
4847 *12*	$(^-)$		G k	XREF: Others: AC, AD, AG, AH XREF: k(4837). J^π: L(d,p)=(3) for $5/2^+$ target.
4894 *12*	$(^+)$		G	J^π: L(d,p)=(2+4) for $5/2^+$ target.
4928 *10*	5^-		G K	J^π: L=5 in (α,α').
4947.2[b] *7*	(12^+)	≤3.5 ns	CD	XREF: Others: AG, AI, AJ

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)[‡]	J^π	$T_{1/2}$[#]	XREF	Comments
				J^π: stretched (Q) γ to (10^+).
4977 *12*			G	J^π: L(d,p)=2 for 4977+4982 doublet.
4982 *12*			G	J^π: L(d,p)=2 for 4977+4982 doublet.
5012 *11*	$-$		G K	J^π: L(d,p)=3 for $5/2^+$ target.
5040 *13*	($^-$)		G	J^π: L(d,p)=(3) for $5/2^+$ target.
5056 *20*	4^+		K	J^π: L=4 in (α,α').
5067 *13*	$2^+,3^+$		G	J^π: L(d,p)=0+2 for $5/2^+$ target.
5091 *13*	$+$		G	J^π: L(d,p)=2 for $5/2^+$ target.
5115 *11*	$(4)^+$		G K N	J^π: L(p,t)=(4); L(d,p)=2 for $5/2^+$ target.
5197 *13*			G	
5215 *13*			G	
5278 *13*			Gh	XREF: Others: AB, AE, AF, AI XREF: h(5269). J^π: L(d,p)=(2,3) for $5/2^+$ target.
5310 *13*	$(2^+,3^+)$		Gh	XREF: Others: AB, AE, AF, AI XREF: h(5269). J^π: L(d,p)=(0+2+4) for $5/2^+$ target.
5358 *13*	$-$		G	J^π: L(d,p)=3 for $5/2^+$ target.
5455 *20*			K	
5490	(0^+)		l N	XREF: Others: AA, AE XREF: l(5510). J^π: L(p,t)=(0).
5537 *20*			Kl	XREF: Others: AA, AE XREF: l(5510).
5581 *20*	(2^+)		K	J^π: L=(2) in (α,α').
5680	(4^+)		N	J^π: L(p,t)=(4).
5685 *20*	3^-		K	J^π: L=3 in (α,α').
5885 *20*	3^-		K V	J^π: L(α,α')=3.
6045.5[@b] *12*	(14^+)		C	XREF: Others: AG, AI, AJ J^π: γ to (12^+); suggested value from (^{48}Ca,4nγ).
6056	3^-		K	J^π: L(α,α')=3.
6125 *20*			K	
6187	3^-		K	J^π: L(α,α')=3.
6240	(4^+)		N	J^π: L(p,t)=(4).
6334	3^-		K	J^π: L(α,α')=3.
6436	3^-		K	J^π: L(α,α')=3.
6990 *90*			V	
7.0×10^3 *4*			P	Possible low energy octupole resonance (1981Ya02). Note: E(res)≈6.3 MeV from (α,α') (1980ToZS).
7.4×10^3 *1*			V	
7445.8[@b] *16*	(16^+)		C	XREF: Others: AG, AI, AJ J^π: 1400γ to (14^+) 6046 in (^{48}Ca,4nγ); band assignment.
8039.1?[@] *19*	$(17,18^+)$	42 ps *14*	C	XREF: Others: AJ J^π: D,E2 593γ feeds (16^+) 7446. (17^-) suggested in (^{48}Ca,4nγ), but (18^+) suggested in (^{13}C,3nγ). $T_{1/2}$: from recoil-distance data, ^{48}Ca(^{48}Ca,4nγ).
(8634.82 *8*)	2^+[a]		F	E(level): thermal neutron capture state(s); not a discrete level.
8.8×10^3 *2*	1^+	1.4 MeV *2*	J	M1 giant resonance.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{92}Zr Levels (continued)

E(level)[‡]	J^π	$T_{1/2}$[#]	XREF	Comments
9127.5[b] *19*	(18$^+$)			XREF: Others: AG J^π: 1681γ to (16$^+$) 7446.
9722.2 *22*	(≤20)			XREF: Others: AJ J^π: 1683γ feeds (17,18$^+$) 8039 level. (20$^+$) suggested in (^{13}C,3nγ);
13.2×10^3 *1*	2$^+$	3.8 MeV *2*	Z	J^π: E2 excitation in (e,e′). GQR. T=0.
13.7×10^3 *5*	2$^+$ & 4$^+$		J	J^π: L(p,p′)=2+4. GMR including 13200, 2$^+$ resonance seen in (e,e′).
15.7×10^3 *1*	0$^+$	4.0 MeV *2*	Z	J^π: E0 excitation in (e,e′). Isoscalar giant monopole resonance.
16.20×10^3 *5*	1$^-$	4.68 MeV	Z	XREF: Others: AB Γ: from (γ,xn)+(γ,np). J^π: E1 excitation in (γ,xn)+(γ,np). GDR. T=1.
17.5×10^3 *3*	0$^+$ & 4$^+$	3.3 MeV	J	Γ: from (p,p′). J^π: L(p,p′)=0+4 giant multipole resonances.
25.1×10^3 *3*	3$^-$	6.3 MeV *3*	P Z	J^π: E3 excitation in (e,e′). T=0. High energy isoscalar octupole giant resonance.
28.1×10^3 *3*	2$^+$	5.9 MeV *2*	Z	J^π: E2 excitation in (e,e′). Isovector GQR.

† State reported also in numerous ^{92}Zr inelastic scattering spectra. Evaluator believes these observations can be attributed largely, if not entirely, to a known 3$^-$ ^{90}Zr state contributing in these experiments via the typical ≈3% ^{90}Zr target impurity. It is unclear whether excitation of the 4$^-$ 2744 level via inelastic scattering is masked by the impurity or absent altogether.

‡ From least-squares fit to adopted Eγ for levels deexcited by gammas, ignoring tentatively-placed lines and allowing 1 keV uncertainty in Eγ whenever no transition from a given level has an author-assigned uncertainty; from weighted average of data from cross-referenced reactions otherwise.

Half-life from ^{88}Sr(^{7}Li,2npγ) for E(level)<8500, width from (e,e′) for E(level)≥8500, except as noted.

@ ΔE=3 keV if 1 keV is assumed for unknown ΔE(γ).

& From DSAM in (n,n′γ).

a J^π=2$^+$,3$^+$ for thermal n capture on 5/2$^+$ target. J^π=2$^+$ is adopted because γγ(θ) data indicate very little, if any, mixing for 6295γ to 3$^-$ state if J=2 but considerable mixing if J=3. Also, γ decay to both 0$^+$ and 4$^+$ levels is observed from the capture state.

b Band(A): π=+ ΔJ=2 sequence. Yrast sequence built on 0$^+$ g.s. (2002Fo03).

Adopted Levels, Gammas (continued)

$\gamma(^{92}Zr)$

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.‡	δ‡	$I_{(\gamma+ce)}$	Comments
934.51	2^+	934.47 *4*	100	0.0	0^+	E2			B(E2)(W.u.)=6.4 *6* E_γ: weighted average of 934.47 *7* from β^- decay, 934.44 *10* from ε decay (10.15 d), 934.46 *5* from (n,γ) E=thermal and 934.5 *1* from (n,n′γ). Mult.: Q to 0^+, from $\gamma(\theta)$ in (^{7}Li,2npγ); $\Delta\pi$=no from RUL. E2 confirmed by α(exp) in ^{92}Nb ε decay (10.15 d).
1382.77	0^+	448.26 *7*	100	934.51	2^+	E2			B(E2)(W.u.)=14.4 *5* E_γ: weighted average of 448.5 *1* (from β^- decay), 448.13 *7*, 448.22 *10*, 448.3 *2* (all from (n,γ) E=thermal) and 448.3 *1* (from (n,n′γ)). (the unweighted average is 448.29 *6*.). Mult.: mult=Q to 2^+, from $\gamma\gamma(\theta)$ in ^{92}Y β^- decay; not M2, from RUL.
		1383		0.0	0^+	E0		0.196 *19*	$I_{(\gamma+ce)}$: from (p,p′γ). E0 transition strength ρ^2(E0)=0.0081 *8* calculated by 1999Wo07.
1495.46	4^+	560.92 *15*	100	934.51	2^+	E2			B(E2)(W.u.)=4.05 *12* E_γ: weighted average of 561.1 *1* from β^- decay and (n,n′γ), 561.0 *2* from (^{7}Li,2npγ) and 560.93 *5* from (n,γ) E=thermal. Mult.: mult=Q from $\gamma(\theta)$ in (^{7}Li,2npγ); not M2 from RUL. δ(Q,O)=+0.04 *2* from (n,n′γ), +0.01 *+11−9* or +1.6 *+4−3* from $\gamma\gamma(\theta)$ in ^{92}Y β^- decay. B(M3)(W.u.) exceeds RUL, unless δ<0.00033.
1847.27	2^+	912.72 *6*	100.0 *23*	934.51	2^+	(M1(+E2))	−0.002 *25*		B(M1)(W.u.)=0.201 *22*; B(E2)(W.u.)=0.001 *+25−1* I_γ: from (n,n′γ). Mult.: mult=D(+Q) from ^{92}Nb(10.15 d) ε decay; $\Delta\pi$=no from level scheme. δ: unweighted average of −0.04 *2* in (n,n′γ), and −0.01 *3* and +0.044 *17* from ε decay (10.15 d).
		1847.27 *5*	51 *3*	0.0	0^+	E2			B(E2)(W.u.)=3.7 *5* E_γ: weighted average of 1847.3 *1*, 1847.5 *3*, 1847.27 *9* and 1847.2 *1* from β^- decay, ε decay (10.15 d), (n,γ) E=thermal and (n,n′γ), respectively. I_γ: unweighted average of 58 *4*, 47.8 *22*, 52 *8* and 44.6 *23* from β^- decay, ε decay (10.15 d), (n,γ) E=thermal and (n,n′γ), respectively (weighted average is 47.9 *25*).
2066.65	2^+	219.07[b] *15*	0.64 *10*	1847.27	2^+				I_γ: weighted average of 0.61 *12* from (n,n′γ), 0.71 *20* from (n,γ) E=thermal.
		571.28 *15*	0.60 *20*	1495.46	4^+				
		1132.12 *5*	100 *3*	934.51	2^+	(M1+E2)	−3.2 *+5−4*		B(M1)(W.u.)<0.0022; B(E2)(W.u.)<15 E_γ: weighted average of 1132.17 *14*, 1132.11 *6* and 1132.1 *1*

From ENSDF

$^{92}_{40}Zr_{52}$-10

Adopted Levels, Gammas (continued)

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[a]	Comments
									from ε decay, (n,γ) E=thermal and (n,n′γ), respectively. Other Eγ: 1132.4 *1* from β^- decay. Mult.: D+Q from $\gamma\gamma(\theta)$ in (n,γ) and (n,n′γ); adopted $\Delta\pi$=no. δ: from δ=−3.2 *+5−4* or +0.85 *7* from 2005Fr17 in (n,n′γ) and −2.7 *+8−15* from (n,γ) E=thermal. Other δ: −2.4 *+3−4* or −1.04 *11* (1978Gl04) in (n,n′γ).
2066.65	2^+	2066.7[@] *4*	0.53[@] *7*	0.0	0^+	E2			B(E2)(W.u.)<0.0042 Mult.,δ: Q (δ=0) from $\gamma(\theta)$ in (n,n′γ); not M2 from RUL.
2339.66	3^-	272.85[b] *24*		2066.65	2^+				E_γ,I_γ: Eγ from (n,γ) E=thermal. Branch absent in β^- decay and (n,n′γ) and one (n,γ) E=thermal study, and Iγ data from the two (n,γ) E=thermal studies that report it are discrepant.
		492.37 *10*	10.8 *5*	1847.27	2^+	(E1(+M2))	≤0.009		B(E1)(W.u.)=0.00067; B(M2)(W.u.)≤1.3 I_γ: unweighted average of 11.7 *7* from (n,n′γ), 10.6 *9* from (n,γ) E=thermal and 10.1 *6* from β^- decay. Weighted average is 10.7 *5*. Mult.: D(+Q) from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=yes from level scheme. δ: +0.01 *3* from (n,n′γ); however, B(M2)(W.u.) exceeds RUL, unless δ<0.009.
		844.12 *6*	29.9 *19*	1495.46	4^+	(E1+M2)	≤0.02		B(E1)(W.u.)≥0.00036; B(M2)(W.u.)≤1.2 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=yes from level scheme. δ: +0.13 *4* (1978Gl04) from (n,n′γ); however, B(M2)(W.u.) exceeds RUL, unless δ<0.02. I_γ: unweighted average of 32.3 *18* from (n,n′γ), 31.1 *22* from (n,γ) E=thermal and 26.2 *17* from β^- decay. Weighted average is 29.6 *20*.
		1405.06 *5*	100 *4*	934.51	2^+	(E1)			B(E1)(W.u.)=0.00030 *4* I_γ: weighted average from (n,n′γ), (n,γ) E=thermal and β^- decay. Mult.: mult=D(+Q) from $\gamma\gamma(\theta)$ in (n,γ), ^{92}Y β^- decay, and from $\gamma(\theta)$ in (n,n′γ); adopted $\Delta\pi$=yes. δ: −0.019 *+21−20* from $\gamma\gamma(\theta)$ in ^{92}Y β^- decay. Others: +0.03 *2* from $\gamma(\theta)$ in (n,n′γ); evaluator rejects value of +0.18 *+20−15* from $\gamma\gamma(\theta)$ in (n,γ). B(M2)(W.u.) exceeds RUL, unless δ<0.04.
		2339.9 *1*	≈0.11	0.0	0^+	E3		0.00049	B(E3)(W.u.)=18.3 *11* E_γ,I_γ: from β^- decay. Other Eγ (Iγ): 2339.4 *22* (0.4 *7*) in (n,γ) E=thermal. Mult.: from form factor in (e,e′). B(E3)(W.u.): from (e,e′). However, B(E3)(W.u.)=48 *13* from adopted $T_{1/2}$ and branching=0.30 *7* from β^- decay; a branch of 0.11 would Be required to reduce this B(E3)(W.u.) to the value obtained in (e,e′), suggesting branching may be overestimated in β^- decay.

$^{92}_{40}Zr_{52}$-11

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[a]	Comments
2398.36	4^+	902.92 *7*	100.0 *21*	1495.46	4^+	M1+E2	−0.11 *+3−2*		B(M1)(W.u.)=0.147 *17*; B(E2)(W.u.)=2.3 *13* I_γ: weighted average from (n,n′γ) and (n,γ) E=thermal. Other δ: +1.30 *+13−30* or −0.13 *9* from (n,n′γ).
		1463.81 *10*	35 *3*	934.51	2^+	E2(+M3)			B(E2)(W.u.)=5.9 *7* B(E2)(W.u.): if δ=0; see comment on δ. I_γ: weighted average of 35.9 *23* from (n,n′γ) and 27 *7* from (n,γ) E=thermal. δ: −0.13 *+5−6* (2005Fr17) in (n,n′γ). However, B(M3)(W.u.) violates RUL, unless δ<0.0007. Other δ: −0.13 *+9−5* (1978Gl04) from (n,n′γ).
2473.4?	(≤2)	2473.6[b] *2*	100	0.0	0^+				
2486.01	5^-	990.52 *9*	100	1495.46	4^+	(E1)			B(E1)(W.u.)≥9.8×10^{-8} May also deexcite the 3057 level. Mult.: mult=D or D(+Q) to 4^+, from $\gamma(\theta)$ in (^{7}Li,2npγ) and (n,n′γ), respectively; $\Delta\pi$=yes from level scheme. δ: +0.04 (1978Gl04) in (n,n′γ).
2743.55	4^-	257.57 *10*	90 *5*	2486.01	5^-	(M1(+E2))	−0.01 *+2−3*	0.01624	B(M1)(W.u.)<0.30 B(M1)(W.u.): if δ=0. I_γ: from (n,n′γ). 72 *7* from (n,γ) E=thermal if I(404γ)=57. Mult.: D(+Q) from (n,n′γ); $\Delta\pi$=no from level scheme. Other δ(D,Q)=+0.09 *+8−5* or ≥11.4 or ≤−22.9 from (n,n′γ).
		344.8 *3*	4.0 *16*	2398.36	4^+				I_γ: from (n,γ) E=thermal branching renormalized so I(404γ)=57.
		403.83 *9*	57 *3*	2339.66	3^-	(M1(+E2))	+0.04 *2*		B(M1)(W.u.)<0.028; B(E2)(W.u.)<0.57 I_γ: from (n,n′γ). Mult.: D(+Q) from (n,n′γ); $\Delta\pi$=no from level scheme. Other δ: 0.00 *4* or −7 *+2−16* from 1978Gl04 in (n,n′γ).
		1248.00 *11*	100 *5*	1495.46	4^+	(E1(+M2))	+0.02 *+6−4*		B(E1)(W.u.)<2.5×10^{-5}; B(M2)(W.u.)<0.20 I_γ: from (n,n′γ). Mult.: D(+Q) from (n,n′γ); $\Delta\pi$=yes from level scheme. Other δ: −0.13 *4* from 1978Gl04 in (n,n′γ).
2819.54	2^+	972.30 *9*	100 *4*	1847.27	2^+	(M1(+E2))	+0.01 *2*		B(M1)(W.u.)=0.196 *24*; B(E2)(W.u.)=0.022 *+87−22* I_γ: weighted average from β^- decay, (n,n′γ) and (n,γ) E=thermal. Mult.: from $\gamma(\theta)$ in (n,n′γ), assuming $\Delta\pi$ from level scheme. δ: +2.3 *+2−1* also possible, but less likely (2005Fr17 in (n,n′γ)). Other δ: −0.18 *4* or +4.5 *+12−8* from 1978Gl04 in (n,n′γ).
		1436.2[b] *6*	4.7 *21*	1382.77	0^+				
		1885.00 *12*	38.7 *23*	934.51	2^+	(M1+E2)			I_γ: unweighted average of 34.2 *19* from (n,n′γ), 41 *4* from from (n,γ) E=thermal and 41 *5* from β^- decay. Weighted average is 36.0 *21*. Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=no from level scheme. δ: −0.14 *4* or +3.7 *+7−5* from (n,n′γ).

$^{92}_{40}Zr_{52}$-12

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ‡	Comments
2819.54	2+	2819.8 3	4.6 4	0.0	0+	E2		B(E2)(W.u.)=0.048 7 E_γ: from β^- decay. Other: 2819.3 7 from (n,n′γ). I_γ: weighted average of 4.5 4 from (n,n′γ) and 6.1 18 from β^- decay.
2864.66	4+	465.94 21	10.6 17	2398.36	4+	(M1(+E2))	−0.01 +15−13	B(M1)(W.u.)=0.068 15; B(E2)(W.u.)=0.03 +99−3 I_γ: weighted average of 11.1 10 from (n,n′γ) and 8.0 22 from (n,γ) E=thermal. Mult.: D(+Q) from (n,n′γ); Δπ=no from level scheme.
		1369.25 10	100 4	1495.46	4+	M1+E2	−0.49 5	B(M1)(W.u.)=0.021 3; B(E2)(W.u.)=2.7 6 I_γ: weighted average of 100 5 from (n,n′γ) and 100 5 from (n,γ) E=thermal.
		1930.13 18	30 4	934.51	2+	E2(+M3)	−0.02 4	B(E2)(W.u.)=0.76 15 I_γ: unweighted average of 26.7 17 from (n,n′γ) and 34 3 from (n,γ) E=thermal. Other δ(Q,O)=+0.32 +19−28 or ≥+3.73 (1978Gl04) for 1928.7γ in (n,n′γ).
2904.08	0+	837.4@ 2	100@ 5	2066.65	2+			Other Eγ: 836.8 2 from (n,γ) E=thermal.
		1969.6@ 3	44@ 5	934.51	2+	E2		B(E2)(W.u.)=0.28 +9−20
2909.43	3+	569.47 17	3.9 11	2339.66	3−			E_γ,I_γ: From (n,γ); alternative placement in (n,n′γ) not adopted.
		842.69 15	32 4	2066.65	2+	M1+E2	−0.25 +7−9	B(M1)(W.u.)=0.026 5; B(E2)(W.u.)=2.4 14
		1414.01 11	60 4	1495.46	4+	M1+E2		δ: −0.50 +6−7 or −1.49 +16−14 from (n,n′γ).
		1974.93 10	100 17	934.51	2+	M1+E2	+0.13 +0−4	B(M1)(W.u.)=0.0066 15; B(E2)(W.u.)=0.030 7
2957.4	6+	471.3&b		2486.01	5−			
		559.6&b		2398.36	4+			
		1461.93 26	100	1495.46	4+	(E2)		B(E2)(W.u.)≥0.00098 E_γ: weighted average of 1461.8 3 in (n,γ) E=thermal and 1462.3 5 from (^{7}Li,2npγ). Mult.: mult=(Q) from γ(θ) in (^{7}Li,2npγ); (6)+ to 4+ transition.
3039.70	3	295.77 19	4.2 8	2743.55	4−			
		700.10 9	23.8 21	2339.66	3−	D(+Q)	+0.08 10	
		1192.49 27	4.6 12	1847.27	2+	D(+Q)	+0.02 +3−2	
		2105.18 8	100 7	934.51	2+	D(+Q)	−0.04 +4−9	δ: if J=3. Other δ: −1.6 +5−8 if J(3039 level)=2 from (n,n′γ).
3057.40	2+	717.9@ 2	31.5@ 19	2339.66	3−	D(+Q)	−0.03 7	Other Eγ: 717.7 3 from (n,γ) E=thermal. Mult.: D(+Q) from γ(θ) in (n,n′γ); Δπ=no from level scheme. δ: from 2005Fr17; other δ: +0.41 +17−14 or +4.5 +31−18 (1978Gl04); all δ from (n,n′γ).
		990.5@ 2	≈100@	2066.65	2+			Doubly placed in (n,n′γ); also deexcites 2486 level.
		1674.9@ 5	6.7@ 5	1382.77	0+	E2		B(E2)(W.u.)=0.64 20
		2123.0@ 3	39.1@ 21	934.51	2+	M1+E2	+0.69 16	B(M1)(W.u.)=0.0034 11; B(E2)(W.u.)=0.37 16
		3057.2@ 5	8.2@ 7	0.0	0+	E2		B(E2)(W.u.)=0.039 12

$^{92}_{40}Zr_{52}$-13

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	Comments
3124.61	$1^{(+)}$	1057.97 *10*	49 *3*	2066.65	2^+	D(+Q)		E_γ: from (n,γ) E=thermal. Other E_γ: 1058.0 *3* from (n,n′γ). I_γ: from (n,n′γ). δ: −3.1 *+15−59* or −0.02 *20* from (n,n′γ).
		1741.6[@] *3*	100[@] *5*	1382.77	0^+	D		E_γ matches that for γ placed from possible 3237 level in (n,γ) E=thermal. Additional information 1.
		2190.3[@] *5*	27.3[@] *17*	934.51	2^+			
		3124.5[@] *5*	31.4[@] *18*	0.0	0^+	D		
3178.31	4^+	779.94 *10*	100.0 *15*	2398.36	4^+	M1(+E2)	−0.04 *4*	B(M1)(W.u.)=0.68 *8*; B(E2)(W.u.)=1.9 *+38−19* I_γ: from (n,n′γ). Mult.: D+Q from (n,n′γ); $\Delta\pi$=no from level scheme.
		2243.80 *26*	25.8 *15*	934.51	2^+	E2(+M3)	+0.06 *+10−9*	B(E2)(W.u.)=1.53 *20* I_γ: from (n,n′γ); 27 *4* from (n,γ) E=thermal.
3190.99	(4^-)	1695.5 *2*	100	1495.46	4^+	D(+Q)	−0.02 *+4−3*	Other δ: −0.09 *13* (1978Gl04), also from (n,n′γ).
3236.9	4^+	1741.8[b] *2*	100	1495.46	4^+	D+Q	−1.09 *+9−10*	Placement may Be questionable; see comment on 1742γ from 3125 level.
3262.62	2^+	2328.17 *13*	100.0 *17*	934.51	2^+	(M1+E2)	−0.06 *3*	B(M1)(W.u.)=0.108 *13*; B(E2)(W.u.)=0.07 *+8−7* I_γ: from (n,n′γ). Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme. δ: from (2005Fr17); other δ: −0.27 *+9−5* (1978Gl04); both from (n,n′γ).
		3262.54 *4*	29.3 *17*	0.0	0^+	E2		B(E2)(W.u.)=1.13 *15* I_γ: from (n,n′γ). Mult.: Q from (γ,γ′); not M2 from RUL.
3275.76	$2^+,3^+$	366.62[b] *19*	8.3 *17*	2909.43	3^+			Uncertain γ in (n,γ), absent in (n,n′γ) so may be misplaced.
		877.45 *10*	23.1 *15*	2398.36	4^+	D,Q		I_γ: from (n,n′γ). Other: 29 *6* from (n,γ) E=thermal. δ: >+10 or +0.08 *+4−5* from (n,n′γ).
		1209.22 *10*	100 *6*	2066.65	2^+	Q(+D)		δ: +0.13 *+0−4* if J=3, ∞ or −0.52 *+11−∞* if J=2 from (n,n′γ).
		1428.7[@] *5*	4.2[@] *5*	1847.27	2^+			Branch is absent in (n,γ) E=thermal.
		2340.90 *16*	45 *4*	934.51	2^+	M1+E2	+4.4 *+8−5*	B(M1)(W.u.)=0.00040 *15*; B(E2)(W.u.)=1.46 *22*
3289.13	3^+	379.60 *10*	78 *4*	2909.43	3^+	D(+Q)		I_γ: from (n,n′γ). Other I_γ: 55 *12* in (n,γ) E=thermal. δ: +0.02 *6* or +1.5 *2* from (n,n′γ).
		891.0 *4*	5 *3*	2398.36	4^+			
		1222.47 *9*	93 *5*	2066.65	2^+	M1+E2		I_γ: from (n,n′γ). Data from (n,γ) E=thermal are discrepant. δ: +0.68 *+9−7* or +2.3 *4* from (n,n′γ).
		1441.2 *3*	26.4 *18*	1847.27	2^+	M1+E2	+0.24 *5*	B(M1)(W.u.)=0.0031 *5*; B(E2)(W.u.)=0.09 *4* E_γ: weighted average of 1441.6 *5* from (n,n′γ) and 1441.0 *4* from (n,γ) E=thermal. I_γ: from (n,n′γ). Other: 12 *3* from (n,γ) E=thermal.
		1793.87 *23*	33.8 *26*	1495.46	4^+	M1+E2	+0.22 *5*	B(M1)(W.u.)=0.0021 *3*; B(E2)(W.u.)=0.033 *15* I_γ: weighted average of 35.2 *22* from (n,n′γ) and 29 *4* from (n,γ) E=thermal.

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[a]	Comments
3289.13	3^+	2354.80 *13*	100 *9*	934.51	2^+	M1+E2	+0.29 *3*		B(M1)(W.u.)=0.0027 *4*; B(E2)(W.u.)=0.042 *10*
3308.7	(8^+)	351.3 *2*	100	2957.4	6^+	E2		0.01276	B(E2)(W.u.)=3.59 *22* Mult.: Q from $\gamma(\theta)$ in (^{7}Li,2npγ); not M2, from RUL.
3371.48	$1^{(-)}$	1032.0 *3*	2.8 *7*	2339.66	3^-				
		1988.71 *10*	100 *13*	1382.77	0^+	(E1)			B(E1)(W.u.)=0.00079 *15* Mult.: D from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$ from level scheme.
		2436.92 *10*	45.1 *20*	934.51	2^+	(E1(+M2))			I_γ: average of 43.1 *26* from (n,n′γ) and 47.0 *26* from (n,γ) E=thermal. Mult.: D(+Q)) from $\gamma(\theta)$ in (n,n′γ), $\Delta\pi$=yes from level scheme. δ: +0.11 *18* or −5 *+3−27* from (n,n′γ).
		3371.2 *3*	51 *5*	0.0	0^+	(E1)			B(E1)(W.u.)=8.2×10^{-5} *14* I_γ: unweighted average of 43 *3* from (n,n′γ), 60 *7* from (n,γ) E=thermal, 50 *7* from β^- decay. (weighted average is 46 *4*.). Mult.: D from (γ,γ'); $\Delta\pi$ from level scheme.
3379.8	(7^-)	893.8	100	2486.01	5^-				E_γ: from ^{173}Yb(^{24}Mg,Fγ)^{92}Zr.
3407.83	$2^-,3^-$	1068.2[@] *2*	100[@] *4*	2339.66	3^-	M1+E2			δ: +5.8 *21* or +0.36 *+6−5* if J=2 from (n,n′γ). Other δ: +1.2 *+7−5* if J=2, −1.7 *+7−28* if J=3, −0.13 *4* if J=4 from $\gamma(\theta)$ in (n,n′γ).
		2473.2[@] *3*	73[@] *4*	934.51	2^+	(E1(+M2))	+0.08 *6*		B(E1)(W.u.)=3.1×10^{-5} *5*; B(M2)(W.u.)=0.15 *+22−15* Other Eγ (Iγ): 2473.6 *2* (159 *19*) from (n,γ) E=thermal. Mult.: D(+Q) from (n,n′γ); $\Delta\pi$=yes from level scheme.
3452.17	$(2)^+$	632.12[b] *24*	7.7 *19*	2819.54	2^+				
		1112.65 *22*	21.7	2339.66	3^-				I_γ: from (n,n′γ). Other Iγ: 23 *8* from (n,γ) E=thermal.
		1604.86 *10*	90 *4*	1847.27	2^+	M1+E2[#]	−1.5 *+5−8*		B(M1)(W.u.)=0.008 *4*; B(E2)(W.u.)=7.4 *18* I_γ: weighted average of 86 *6* from (n,γ) E=thermal and 92 *5* from (n,n′γ).
		1956.60 *12*	67 *6*	1495.46	4^+				Other Iγ: 36 *3* from (n,n′γ).
		2069.5 *4*	16 *5*	1382.77	0^+				
		2517.73 *11*	100 *4*	934.51	2^+	M1+E2	+2.0 *12*		B(M1)(W.u.)=0.0016 *16*; B(E2)(W.u.)=1.0 *3*
3463.04	$(4)^+$	1967.53 *15*	100.0 *23*	1495.46	4^+				I_γ: from (n,n′γ).
		2528.7[@] *5*	33.8[@] *23*	934.51	2^+	E2(+M3)	≤+0.005		B(E2)(W.u.)=0.41 *+6−7* B(E2)(W.u.): if pure E2. δ: +0.11 *10* from (n,n′γ); B(M3)(W.u.) exceeds RUL, unless $\delta\leq$0.005. Other Iγ: 24 *5* from (n,γ) E=thermal.
3471.88	1^+	2089.6[@] *5*	17.9[@] *14*	1382.77	0^+	(M1)			B(M1)(W.u.)=0.052 *8* Mult.: D from $\gamma(\theta)$ in (n,n′γ); $\Delta\pi$=no from level scheme.
		2537.1 *2*	39.2 *23*	934.51	2^+	M1			B(M1)(W.u.)=0.063 *9* I_γ: from (n,n′γ); 37 *3* from (n,γ) E=thermal. δ: 0.0 *3* or −3.4 *+17−280* from (n,n′γ); M1 from (pol γ,γ').

Adopted Levels, Gammas (continued)

$\gamma(^{92}\mathrm{Zr})$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	Comments
3471.88	1^+	3471.9[@] *5*	100[@] *5*	0.0	0^+	M1		B(M1)(W.u.)=0.063 *9* Other Eγ (Iγ): 3472.6 *3* (100 *16*) from (n,γ) E=thermal. Mult.: from (pol γ,γ′); confirmed by γ(θ) in (n,n′γ).
3499.88	2^+	224.7 *3*	3.6 *12*	3275.76	$2^+,3^+$			
		590.67 *22*	10.8 *24*	2909.43	3^+			
		680.65 *21*	9.6 *24*	2819.54	2^+			
		1159.54 *16*	22.4 *18*	2339.66	3^-	(E1(+M2))	−0.04 *15*	B(E1)(W.u.)=0.00038 *5*; B(M2)(W.u.)=2.1 *+155−21* I_γ: from (n,n′γ). Other: 30 *4* from (n,γ) E=thermal. Mult.: D(+Q) from γ(θ) in (n,n′γ); Δπ=yes from level scheme.
		1433.6[@] *4*	19.3[@] *14*	2066.65	2^+			Other Eγ (Iγ): 1433.9 *3* (51 *12*) from (n,γ) E=thermal.
		1652.8[@] *3*	56[@] *3*	1847.27	2^+	M1+E2		Other Eγ (Iγ): 1652.79 *13* (69 *6*) from (n,γ) E=thermal. δ: −0.11 *+3−5* or +3.3 *+6−4*.
		2565.6[@] *5*	15.8[@] *13*	934.51	2^+	M1+E2		Branch is absent in (n,γ) E=thermal. δ: −0.62 *+16−27* or −7 *+3−57*.
		3499.8[@] *5*	100[@] *5*	0.0	0^+	E2		B(E2)(W.u.)=0.35 *4* Other Eγ (Iγ): 3500.8 *6* (100 *25*) from (n,γ) E=thermal.
3609.5	(0^+)	1762.3[@] *5*	29[@] *4*	1847.27	2^+			
		2674.8[@] *5*	100[@] *4*	934.51	2^+			
3628.33	(4^+)	588.32 *24*	1.6 *4*	3039.70	3			
		808.67 *22*	2.9 *4*	2819.54	2^+			
		884.74 *11*	17.5 *17*	2743.55	4^-			
		1229.81 *22*	3.6 *7*	2398.36	4^+			
		2132.90 *11*	25.8 *25*	1495.46	4^+			
		2693.86 *12*	100 *11*	934.51	2^+			
3638.2	1^-	2255.4[@] *3*	14.1[@] *16*	1382.77	0^+	(E1)		B(E1)(W.u.)=0.00043 *8* Mult.: D from γ(θ) in (n,n′γ); Δπ=yes from level scheme.
		3638.0[@] *5*	100.0[@] *16*	0.0	0^+	E1		B(E1)(W.u.)=0.00072 *10* Mult.: from (pol γ,γ′).
3640.28	$(2)^+$	601.1[b] *3*	3.3 *13*	3039.70	3			
		821.0 *3*	4.0 *13*	2819.54	2^+			
		1301.0 *5*	9 *3*	2339.66	3^-			I_γ: from (n,n′γ).
		2705.76 *12*	100 *15*	934.51	2^+	M1+E2		I_γ: 100.0 *26* from (n,n′γ). δ: +3.5 *4* or −0.12 *+3−4* from (n,n′γ).
3649.22	3^+	1162.7 *3*	35 *8*	2486.01	5^-			
		1251.16 *18*	52 *4*	2398.36	4^+	M1+E2		I_γ: weighted average of 56 *6* from (n,γ) E=thermal and 50 *5* from (n,n′γ). δ(D,Q)=+12 *+52−6* or +0.22 *+7−8* from (n,n′γ).
		1800.74[b] *27*	26 *4*	1847.27	2^+	D(+Q)		I_γ: from (n,n′γ); 43 *11* from (n,γ) E=thermal. δ(D,Q)=−3.8 *+9−14* or −0.08 *8* from (n,n′γ).
		2153.68 *18*	100 *7*	1495.46	4^+	M1+E2		I_γ: from (n,n′γ); 100 *11* from (n,γ) E=thermal. δ(D,Q)=−3.9 *+7−9* or −0.12 *4* from (n,n′γ).

$^{92}_{40}\mathrm{Zr}_{52}$-16

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	Comments
3649.22	3^+	2714.1 4	73 5	934.51	2^+	M1+E2	−0.73 +12−18	B(M1)(W.u.)=0.0038 10; B(E2)(W.u.)=0.28 9 I_γ: from (n,n′γ); 97 16 from (n,γ) E=thermal.
3667.1	1	3667	100	0.0	0^+	D		E_γ: from level-energy difference. Mult.: from (γ,γ′); if M1, B(M1)(W.u.)=0.0037 6 (2002We15 in (γ,γ′)).
3675.8	$3^+,4^+,5^+$	2180.3[@] 4	100[@]	1495.46	4^+	M1+E2	+3.6 +6−5	B(M1)(W.u.)=0.0013 5; B(E2)(W.u.)=3.7 +7−8 Mult.: D+Q from γ(θ) in (n,n′γ); Δπ=no from RUL.
3696.8	$1^{(+)}$	2762.3[@] 4	99[@] 7	934.51	2^+	(M1+E2)	+1.3 +28−8	B(M1)(W.u.)=0.011 +31−11; B(E2)(W.u.)=3 +5−3 Mult.: D+Q from γ(θ) in (n,n′γ); Δπ=(no) from RUL.
		3696.5[@] 7	100[@] 7	0.0	0^+	(M1)		B(M1)(W.u.)=0.0127 24 Mult.: D from (γ,γ′); Δπ=no from level scheme.
3774.6	$(1,2^+)$	1708.1[@] 5	49[@] 10	2066.65	2^+			
		1927.1[@] 5	35[@] 7	1847.27	2^+			
		2839.9[@] 5	100[@] 20	934.51	2^+			
		3774.6[@] 8	46[@] 9	0.0	0^+			Mult.: not M2 from RUL.
3804.7	(≤4)	2870.1[@] 5	100[@]	934.51	2^+			
3819.4	(8^-)	439.6 5	100	3379.8	(7^-)	D		Mult.: from γ(θ) in (^{7}Li,2npγ).
3830.31	$(1^-,2^+)$	378.21 16	38 6	3452.17	$(2)^+$			
		790.70 11	75 15	3039.70	3			
		1490.7 3	92 18	2339.66	3^-			I_γ: from (n,n′γ).
		1763.39 18	58 6	2066.65	2^+			
		2447.3 3	34 6	1382.77	0^+			
		2895.1[@] 10	100[@] 18	934.51	2^+			
3915	1	3915	100	0.0	0^+	D		E_γ: from level-energy difference. Mult.: from (γ,γ′); if M1, B(M1)(W.u.)=0.022 3 (2002We15 in (γ,γ′)).
3998.7?	(9^-)	179.4[b] 5	57 6	3819.4	(8^-)	D		Mult.: from γ(θ) in (^{7}Li,2npγ).
		618.8[b]	≈100	3379.8	(7^-)			E_γ: from ^{173}Yb(^{24}Mg,Fγ)^{92}Zr.
4296.6	(10^+)	987.9 2	100	3308.7	(8^+)	(Q)		Mult.: from γ(θ) in (^{7}Li,2npγ).
4947.2	(12^+)	650.6 5	100	4296.6	(10^+)	(E2)		B(E2)(W.u.)≥0.056 Mult.: (Q) from γ(θ) in (^{7}Li,2npγ); not M2, from RUL.
6045.5	(14^+)	1098.3	100	4947.2	(12^+)			E_γ: from ^{173}Yb(^{24}Mg,Fγ)^{92}Zr.
7445.8	(16^+)	1400.3	100	6045.5	(14^+)			E_γ: from ^{173}Yb(^{24}Mg,Fγ)^{92}Zr.
8039.1?	$(17,18^+)$	593[b]	100	7445.8	(16^+)	D,E2		Mult.: from RUL.
(8634.82)	2^+	4804.7		3830.31	$(1^-,2^+)$			
		4985.1 7	2.8 8	3649.22	3^+			
		4995.0 3	6.7 8	3640.28	$(2)^+$			
		5006.1 3	11.8 8	3628.33	(4^+)			

$\gamma(^{92}Zr)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Comments
(8634.82)	2^+	5134.6 *3*	3.6 *4*	3499.88	2^+	
		5162.5 *3*	3.6 *4*	3471.88	1^+	
		5183.0 *5*	7.0 *14*	3452.17	$(2)^+$	
		5263.2 *5*	21.6 *24*	3371.48	$1^{(-)}$	
		5347.1		3289.13	3^+	
		5359.5		3275.76	$2^+,3^+$	
		5371.2 *5*	6.1 *14*	3262.62	2^+	
		5594.7 *4*	1.6 *4*	3039.70	3	
		5815.0 *3*	1.2 *4*	2819.54	2^+	
		6237.2 *6*	1.2 *4*	2398.36	4^+	
		6294.88 *12*	100 *3*	2339.66	3^-	
		6568.2		2066.65	2^+	
		7139.5		1495.46	4^+	
		7251.8 *9*	0.4 *4*	1382.77	0^+	
		7701.2		934.51	2^+	
		8634.4 *2*	5.1 *4*	0.0	0^+	
9127.5	(18^+)	1681.3[&b]	100	7445.8	(16^+)	
9722.2	(≤ 20)	1683[b]		8039.1?	$(17,18^+)$	E_γ: from $(^{13}C,3n\gamma)$ only.

[†] From (n,γ) E=thermal, except as noted. Uncertainty in $E\gamma$ from this source may include 100 eV systematic uncertainty combined in quadrature with experimental statistical uncertainty.

[‡] From $\gamma(\theta)$ in $(n,n'\gamma)$, except as noted, assigning $\Delta\pi$=no from RUL whenever relevant.

[#] For additional mult and δ information, see $\gamma(\theta)$ from $(n,n'\gamma)$.

[@] From $(n,n'\gamma)$.

[&] from $^{173}Yb(^{24}Mg,F\gamma)^{92}Zr$; unconfirmed in $^{176}Yb(^{28}Si,X\gamma)$ or $^{176}Yb(^{31}P,X\gamma)$ so placement shown as tentative here.

[a] 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.

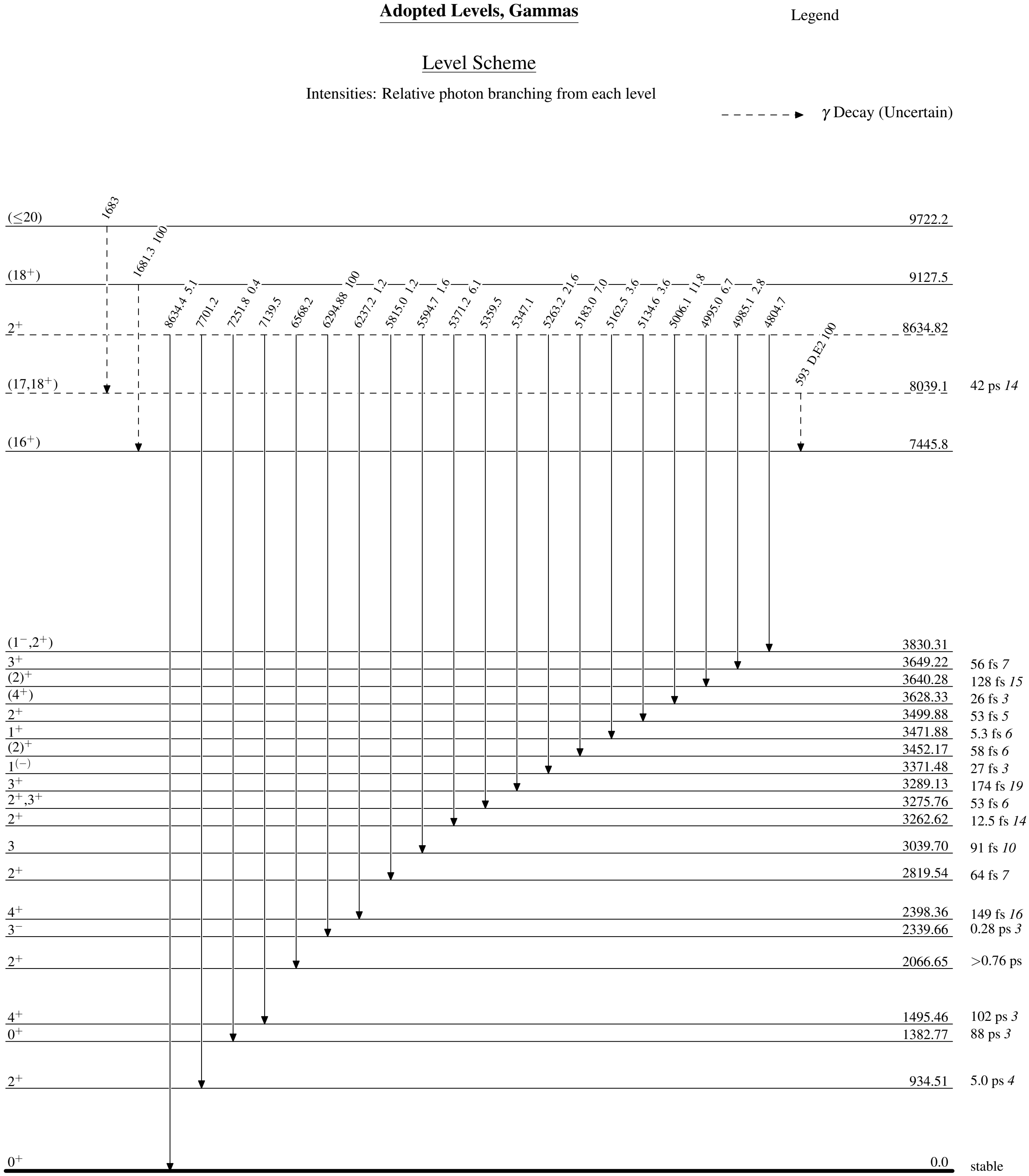
[b] Placement of transition in the level scheme is uncertain.

$^{92}_{40}Zr_{52}$-18

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

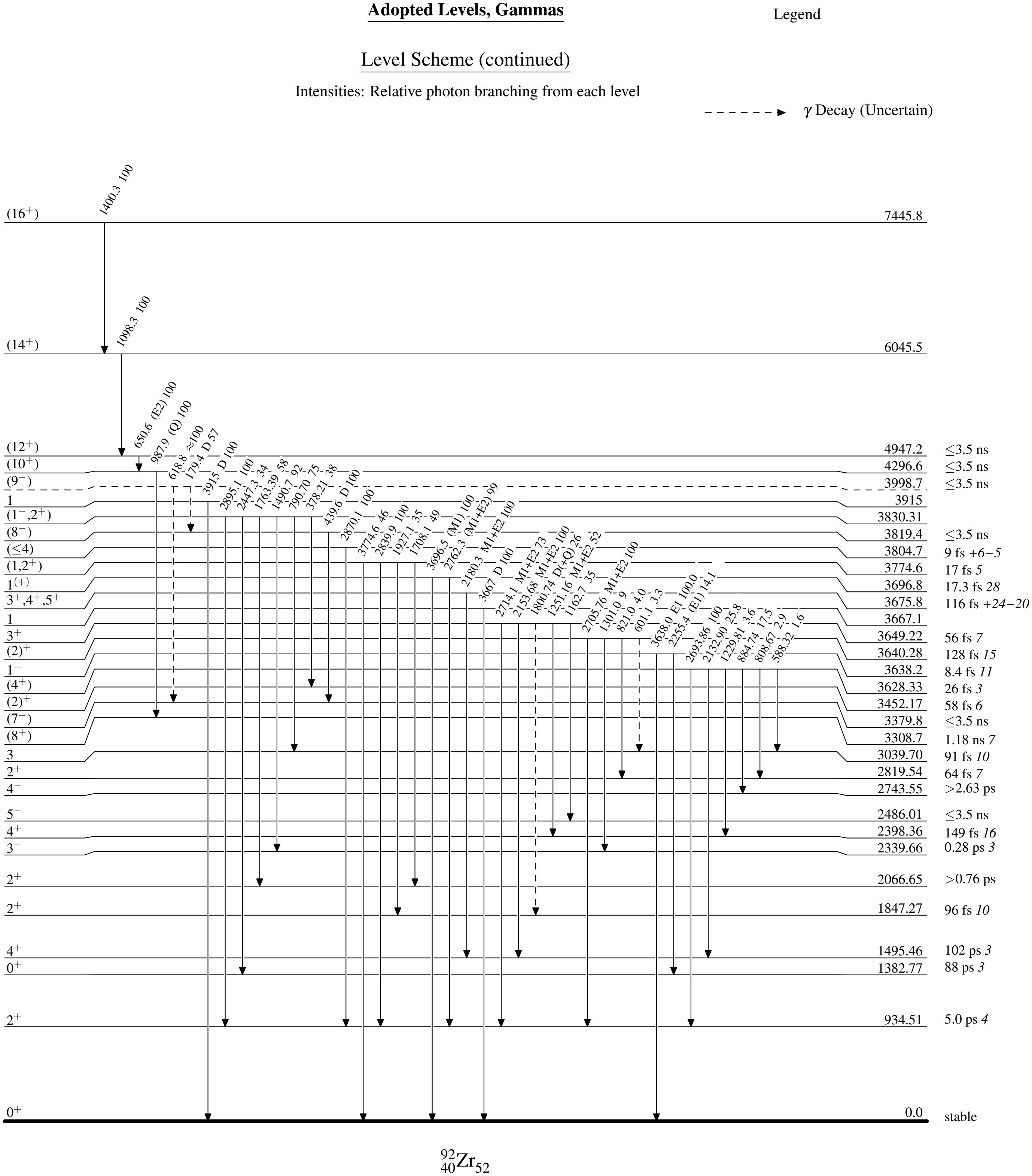


$^{92}_{40}Zr_{52}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



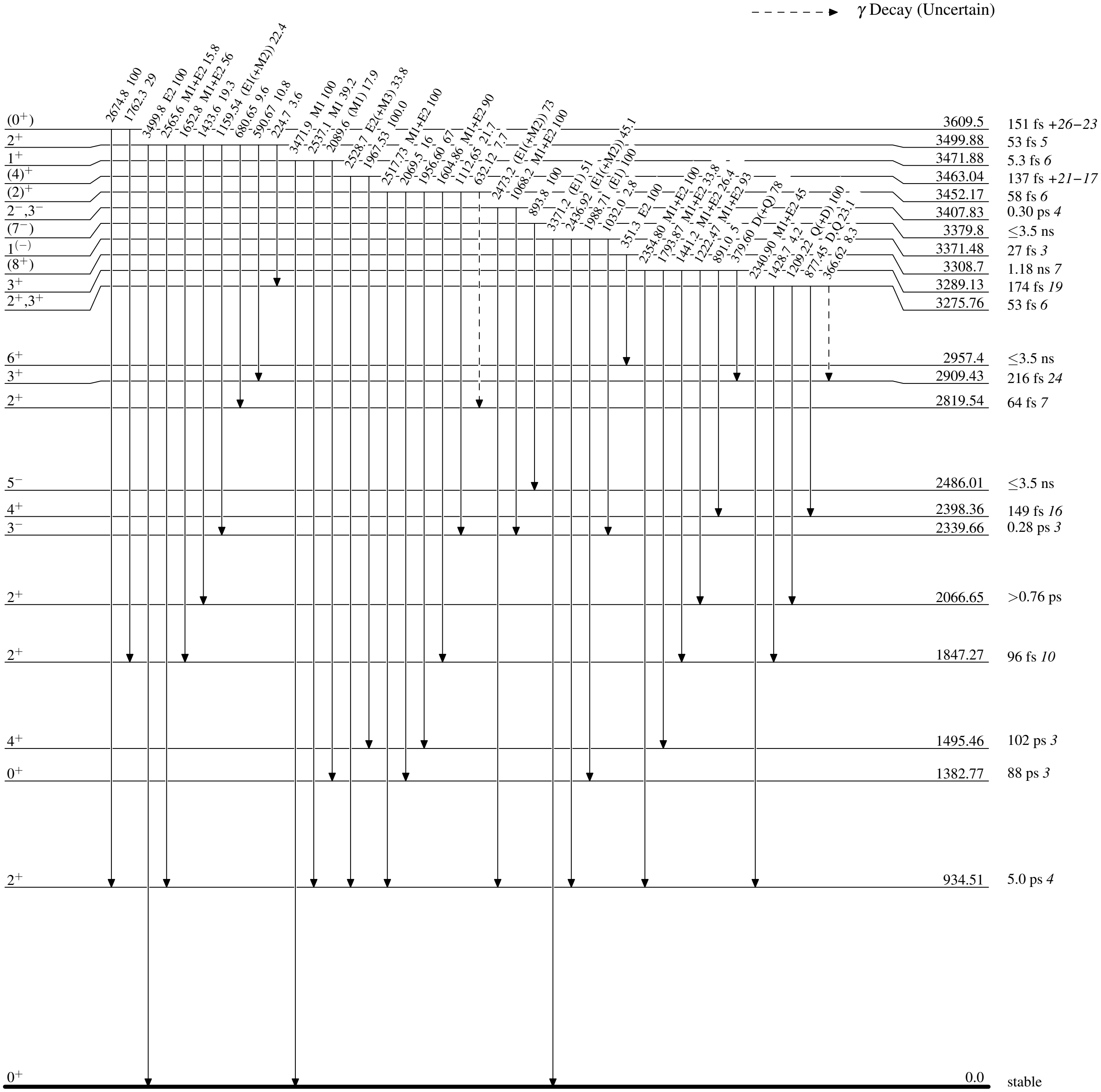
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

γ Decay (Uncertain)



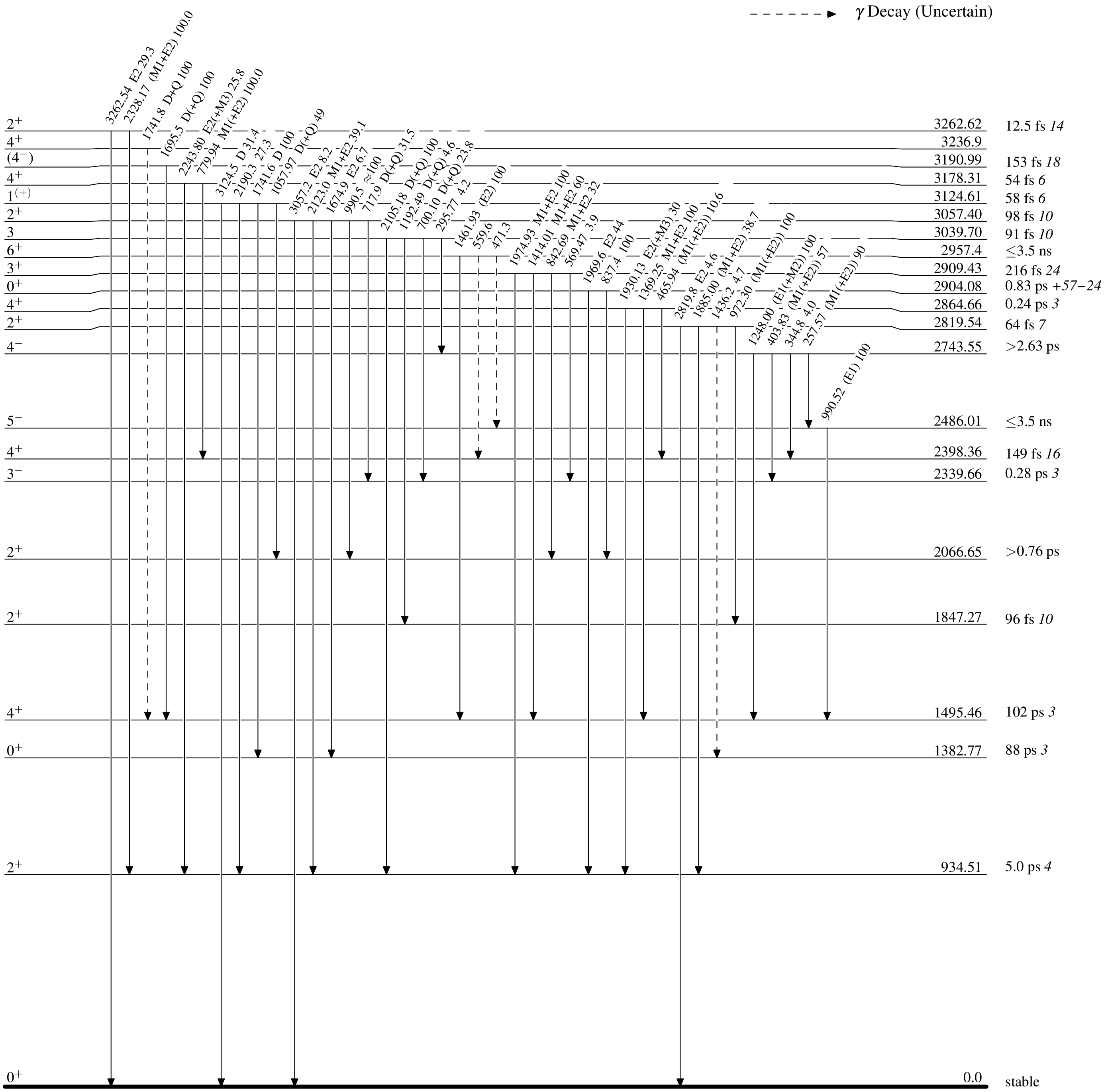
$^{92}_{40}Zr_{52}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

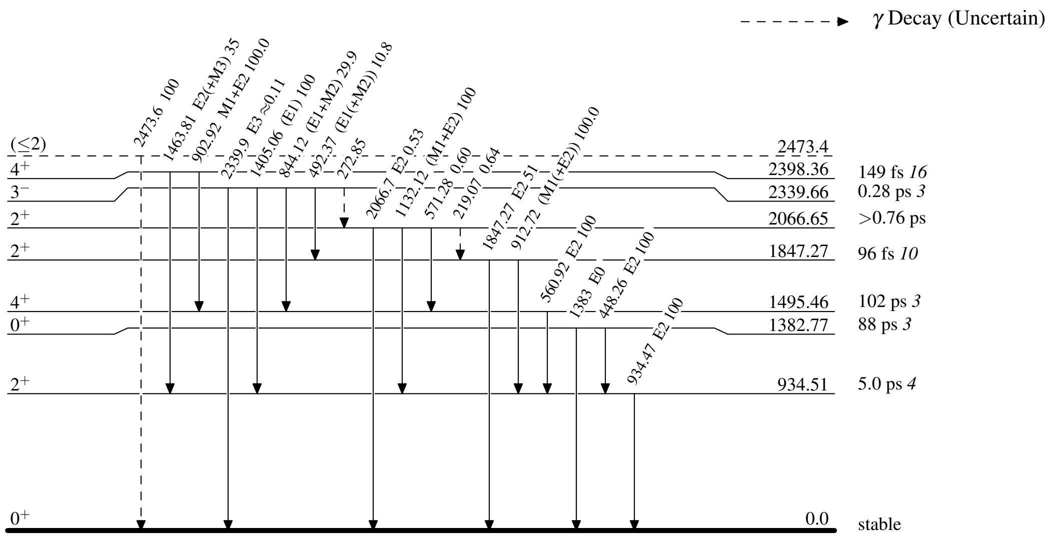


$^{92}_{40}Zr_{52}$

Adopted Levels, Gammas

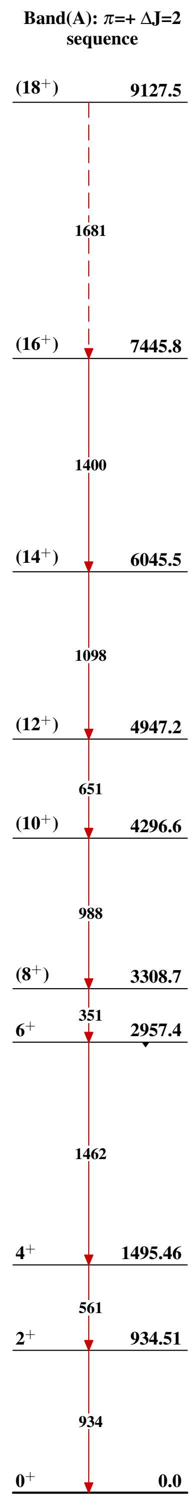
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{92}_{40}Zr_{52}$

Adopted Levels, Gammas



$^{92}_{40}Zr_{52}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 107,2423 (2006)	1-Jan-2006

Q(β^-)=−901.7 *22*; S(n)=8219.5 *19*; S(p)=10332 *11*; Q(α)=−3747 *3* 2012Wa38
Note: Current evaluation has used the following Q record −902.3 228221.1 *2010333* 11-3750 3 2003Au03.
Q($2\beta^-$)=1142.9 keV 19 (2003Au03).

^{94}Zr Levels

Cross Reference (XREF) Flags

A	^{94}Y β^- decay	G	^{94}Zr(t,t′)	M	^{96}Zr(p,t)
B	^{92}Zr(t,p)	H	^{94}Zr(^{3}He,^{3}He′)	N	^{98}Mo(d,^{6}Li)
C	^{94}Zr(n,n′γ)	I	^{94}Zr(α,α′)	O	^{173}Yb(^{24}Mg,Fγ)
D	^{94}Zr(p,p′)	J	Coulomb excitation	P	^{176}Yb(^{28}Si,Fγ)
E	^{94}Zr(p,p′γ)	K	^{94}Mo(^{6}Li,^{8}B)		
F	^{94}Zr(d,d′)	L	^{94}Mo(^{14}C,^{16}O)		

E(level)[†]	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	0$^+$	stable	ABCDEFGHIJKLMNOP	T$_{1/2}$: >1.9×10^{19} y for ^{94}Zr(g.s.) to ^{94}Mo(g.s.) 2ν 2β^- decay, T$_{1/2}$> 0.23×10^{19} y for ^{94}Zr(g.s.) to ^{94}Mo(g.s.) neutrinoless 2β^- decay. Other: T$_{1/2}$>1.3×10^{19} y for ^{94}Zr(g.s.) to ^{94}Mo(2$^+$) 2β^- decay (1987No03). Δ<r^2>(fm^2): (^{92}Zr,^{94}Zr)=0.176 *20* (1987Bo56), (^{94}Zr,^{96}Zr)=0.126 *23* (1987Bo56), 0.117 *14* (1988Ga26) all from measured isotopic shifts. <r^2>$^{1/2}$=4.3312 fm *9* (2004An14).
918.75 *5*	2$^+$	6.9 ps *15*	ABCDEFGHIJKLMNOP	μ=−0.66 *3* μ: From 1999Ja13 from γ-ray angular distribution of recoil ions slowing down in polarized Gadolinium following Coulomb excitation. Other: μ=−0.52 *12* (1989Ra17) μ=−0.14 *14* (1978Ge19). Both values are from γ-ray angular distribution of recoil ions slowing down in polarized iron following Coulomb excitation. J$^\pi$: L(p,t)=2. T$_{1/2}$: from B(E2) in Coulomb Excitation. Δ<r^2>(^{94}Zr,^{96}Zr) (fm^2)=0.117 *14* (1988Ga26) optical isotopic shift.
1300.19 *12*	0$^+$	0.291 ns *11*	ABCDEFG KLMN	J$^\pi$: L(p,t)=0. T$_{1/2}$: from $\beta\gamma\gamma$(t) (1990Ma40). Other: 0.28 ns *4* from (p,p′γ).
1469.62 *10*	4$^+$	0.500 ns *13*	ABCD FG I MNOP	J$^\pi$: L(p,t)=4. T$_{1/2}$: from $\beta\gamma\gamma$(t) (1990Ma40).
1671.41 *7*	2$^+$		ABCD FGHI KLMN	J$^\pi$: L(p,t)=2.
2057.63 *10*	3$^-$		ABCD FGHIJ MN	J$^\pi$: L(p,t)=3.
2151.31 *20*	2$^+$		A CD F M	J$^\pi$: L(p,t)=2.
2329.9 *4*	4$^+$		A CD F I OP	J$^\pi$: L(α,α′)=4.
2366.12 *14*	2$^+$		ABCD FG I MN	J$^\pi$: L(p,t)=2.
2401? *6*			F	
2507.7 *5*	(3)$^+$		C F	J$^\pi$: M1+E2 γ′s to 2$^+$, γ from 4$^+$, supported by Wolfenstein-Hauser-Feshbach calculations for (n,n′γ).
2605.0 *5*	5$^-$		BCD FG I MNOP	J$^\pi$: L(p,t)=5.
2698.5 *10*	(1,2,3)		C F	J$^\pi$: from (n,n′γ):measured $\gamma(\theta)$ compared to to Wolfenstein-Hauser-Feshbach calculations.
2719?			F	
2769?			F	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{94}Zr Levels (continued)

E(level)†	J^π	XREF	Comments
2826.0 *6*	(2,3)	C F	J^π: from (n,n′γ):measured γ(θ) compared to to Wolfenstein-Hauser-Feshbach calculations.
2846.3 *3*	(1$^-$)	A CD F	J^π: L(d,d′)=1,4; γ to 0$^+$.
2860.6 *11*	4$^+$	C FG	J^π: L(d,d′)=4.
2888.2 *17*	4$^+$	BCD F I	J^π: L(α,α′)=4.
2908.05? *20*	(2$^+$)	A F	J^π: L(d,d′)=2,3,4; γ to 0$^+$.
2925 *5*	(1$^-$,3$^-$,4$^+$)	F	J^π: L(d,d′)=1,3,4.
2945.0 *4*	5$^-$	ABCD I	J^π: L(α,α′)=5.
3014‡ *8*		B	
3030 *6*		F	E(level): probably a doublet.
3059.31 *17*	(1,2,3)$^+$	A C F I	J^π: log *ft*=7.4 in β^- decay from 2$^-$.
3142.4 *4*	(6$^+$)	OP	
3156.4 *9*	(4$^+$)	BCD F I	J^π: L(α,α′)=4.
3219.42 *13*	(1,2,3)	ABCD FG I	J^π: log *ft*=7.2 in β^- decay from 2$^-$, possibly L(d,d′)=3.
3281 *6*	(2$^+$)	F	J^π: L(d,d′)=2.
3316 *6*		F	E(level): possible doublet.
3331 *6*	(5$^-$)	D F I	J^π: L(α,α′)=5. Due to poor back angle statistics this assignment is not certain.
3361.16 *18*	(1,2,3)	ABCD FG I	J^π: log *ft*=7.3 in β^- decay from 2$^-$, possibly L(α,α′)=3.
3407 *6*	(3$^-$,4$^+$)	F I	J^π: L(d,d′)=1,3,4; L(α,α′)=(3,4).
3442.5 *5*	(7$^-$)	OP	
3482‡ *8*		B D F I	
3560‡ *7*	(4$^+$)	B F I	J^π: L(α,α′)=4.
3594.8 *6*		OP	
3598 *7*	(5$^-$)	D F I	E(level): probable triplet in (d,d′). J^π: L(α,α′)=5.
3631.6 *4*	(8$^+$)	OP	
3686 *7*		F I	E(level): probable doublet in (d,d′).
3724.9 *6*	(2,3,4)$^+$	A F I	J^π: log *ft*=7.8 in β^- decay from 2$^-$, γ′s to 2$^+$ and 4$^+$, possibly L(α,α′)=(4).
3776 *7*	(0$^+$)	D F	J^π: L(d,d′)=0.
3840 *7*		B FG	
3884 *7*		F	E(level): probable doublet in (d,d′).
3897 *7*	(4$^+$)	B D F I	J^π: L(α,α′)=4.
3961.8? *3*	(2)$^+$	A	J^π: log *ft*=6.8 in β^- decay from 2$^-$, γ′s to 0$^+$ and 4$^+$.
4002.2 *15*	(1,2)$^+$	AB D F	J^π: log *ft*=8.1 in β^- decay from 2$^-$, γ to 0$^+$.
4052.4 *15*	(1,2)$^+$	A	J^π: log *ft*=8.3 in β^- decay from 2$^-$, γ to 0$^+$.
4081 *8*	(3$^-$)	F I	J^π: L(α,α′)=(3). E(level): probable doublet in (α,α′).
4098.5 *15*	(1,2)$^+$	A	J^π: log *ft*=7.7 in β^- decay from 2$^-$, γ to 0$^+$.
4149 *8*	(7$^-$)	F I	J^π: L(α,α′)=7.
4198.8? *3*	(1,2)$^+$	A D	J^π: log *ft*=6.3 in β^- decay from 2$^-$, γ to 0$^+$.
4224.2 *7*		D F OP	E(level): probably a doublet in (d,d′).
4237.6? *4*	(1,2,3)$^+$	A	J^π: log *ft*=6.7 in β^- decay from 2$^-$.
4340 *8*	(4$^+$)	F I	J^π: L(p,p′)=4.
4369.8 *8*		OP	
4479.3 *5*	(10$^+$)	OP	
4637.9? *8*	(1,2,3)$^+$	A	J^π: log *ft*=6.1 in β^- decay from 2$^-$.
4669.8? *8*	(1$^-$,2$^-$,3$^-$)	A	J^π: log *ft*=5.8 in β^- decay from 2$^-$.
4812.4 *6*	(12$^+$)	OP	
5490.9 *6*	(11$^+$)	OP	
5804.5 *7*	(12$^+$)	OP	
6006.8 *7*	(13$^+$)	OP	
6371.7 *8*	(14)	OP	
7055.0 *9*	(15)	OP	
7791.8 *10*	(16)	OP	
8980.6 *12*		O	

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Adopted Levels, Gammas (continued)

^{94}Zr Levels (continued)

† Deduced from the adopted γ's if not indicated otherwise.
‡ From (t,p).

Adopted Levels, Gammas (continued)

$\gamma(^{94}Zr)$

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[&]	δ[&]	α[a]	$I_{(\gamma+ce)}$	Comments
918.75	2^+	918.74 5	100	0.0	0^+	E2[@]		0.00083		α(K)=0.00072 2 B(E2)(W.u.)=4.9 3
1300.19	0^+	381.57 19	100	918.75	2^+	[E2]		0.0099		α(K)=0.0085 3; α(L)=0.00102 3 B(E2)(W.u.)=9.4 4
		1300.18[#] 18		0.0	0^+	E0[@]			0.40 4	
1469.62	4^+	550.88 10	100	918.75	2^+	[E2]		0.00319		α(K)=0.00276 9; α(L)=0.00032 1 B(E2)(W.u.)=0.879 23
1671.41	2^+	752.60 10	100 4	918.75	2^+					
		1671.41 10	71 10	0.0	0^+					
2057.63	3^-	588.0 10	2.8 9	1469.62	4^+					
		1138.88 10	100 7	918.75	2^+					
2151.31	2^+	1232.55 19	100	918.75	2^+	M1+E2	−1.7 +8−14	0.00038		α(K)=0.00038
2329.9	4^+	860	<3.0	1469.62	4^+					
		1411.4 6	100 15	918.75	2^+	E2(+M3)	−0.13 +13−9	0.00029 4		α(K)=0.00029 3
2366.12	2^+	308.22 28	18.3 18	2057.63	3^-	E1(+M2)	+0.04 +22−27	0.005 3		α(K)=0.0040 22; α(L)=0.0004 3
		694.66 29	100 3	1671.41	2^+	M1(+E2)		0.00160 8		α(K)=0.00139 7; α(L)=0.00015 1
		1066.3 4	12 3	1300.19	0^+	E2		0.00051		α(K)=0.00051 2
		1447.41 19	64 4	918.75	2^+	M1+E2	+0.64 +14−12	0.00027		α(K)=0.00027
2507.7	$(3)^+$	836.0 7	14.9 11	1671.41	2^+	M1+E2	−0.84 4	0.00102		α(K)=0.00089; α(L)=9.8×10^{-5}
		1589.5 9	100.0 11	918.75	2^+	M1+E2				
2605.0	5^-	1134.9 8	100	1469.62	4^+					
2698.5	(1,2,3)	1779.7 10	100	918.75	2^+					
2826.0	(2,3)	1154.6 6	100	1671.41	2^+					
2846.3	(1^-)	1927.5 6	11 3	918.75	2^+					
		2846.3 3	100 11	0.0	0^+					
2860.6	4^+	1391.0 11	100	1469.62	4^+					
2888.2	4^+	1969.4 17	100	918.75	2^+					
2908.05?	(2^+)	1236.60[b] 20	1.0×10^2 3	1671.41	2^+					
		1989.3[b] 7	30 9	918.75	2^+					
		2908.4[b] 8	35 13	0.0	0^+					
2945.0	5^-	887.4 4	100	2057.63	3^-					
3059.31	$(1,2,3)^+$	1001.8 3	6.5 18	2057.63	3^-					
		1384.9[b] 10		1671.41	2^+					
		2140.60 20	100 12	918.75	2^+					
3142.4	(6^+)	537.2 4	17.9	2605.0	5^-					
		812.5 2	100	2329.9	4^+					
		1672.9 7	3.8	1469.62	4^+					
3156.4	(4^+)	648.7 8		2507.7	$(3)^+$					
		2237.3 25		918.75	2^+					
3219.42	(1,2,3)	1161.79 10	100 12	2057.63	3^-					

$^{94}_{40}Zr_{54}$-4

$\gamma(^{94}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Comments
3219.42	(1,2,3)	1751.1 *13*		1469.62	4^+	
		2300.5 *3*	26 *4*	918.75	2^+	
3361.16	(1,2,3)	1303.8 *6*	12 *3*	2057.63	3^-	
		1891.60 *20*	100 *12*	1469.62	4^+	
		2442.1 *3*	36 *7*	918.75	2^+	
3442.5	(7^-)	837.4 *2*	100	2605.0	5^-	
3594.8		152.3 *4*	100	3442.5	(7^-)	
3631.6	(8^+)	489.2 *2*	100	3142.4	(6^+)	
3724.9	$(2,3,4)^+$	2255.3[b] *7*	1.0×10^2 *3*	1469.62	4^+	
		2805.9[b] *10*	1.0×10^2 *3*	918.75	2^+	
3961.8?	$(2)^+$	1904.6[b] *8*	16 *5*	2057.63	3^-	
		2492.0[b] *3*	100 *16*	1469.62	4^+	
		2662.4[b] *10*	13 *5*	1300.19	0^+	
4002.2	$(1,2)^+$	4002.1 *15*	100	0.0	0^+	
4052.4	$(1,2)^+$	4052.3 *15*	100	0.0	0^+	
4098.5	$(1,2)^+$	4098.4 *15*	100	0.0	0^+	
4198.8?	$(1,2)^+$	2527.3[b] *4*	100 *17*	1671.41	2^+	
		2898.7[b] *6*	50 *11*	1300.19	0^+	
4224.2		629.3 *7*		3594.8		
		782.0 *7*		3442.5	(7^-)	
4237.6?	$(1,2,3)^+$	2566.2[b] *5*	1.0×10^2 *3*	1671.41	2^+	
		3318.7[b] *7*	$8.\times10^1$ *3*	918.75	2^+	
4369.8		145.7 *7*	32 *3*	4224.2		
		927.2	100 *8*	3442.5	(7^-)	E_γ: seen only in $^{176}Yb(^{28}Si,F\gamma)$.
4479.3	(10^+)	847.7 *2*	100	3631.6	(8^+)	
4637.9?	$(1,2,3)^+$	2966.6[b] *10*	1.0×10^2 *5*	1671.41	2^+	
		3718.8[b] *15*	$8.\times10^1$ *5*	918.75	2^+	
4669.8?	$(1^-,2^-,3^-)$	2998.4[b] *10*	1.0×10^2 *5*	1671.41	2^+	
		3750.9[b] *15*	$7.\times10^1$ *3*	918.75	2^+	
4812.4	(12^+)	333.1 *4*	100	4479.3	(10^+)	
5490.9	(11^+)	1011.6 *4*	100	4479.3	(10^+)	
5804.5	(12^+)	313.6 *4*	100	5490.9	(11^+)	
6006.8	(13^+)	202.3 *4*	100 *24*	5804.5	(12^+)	
		1194.4 *4*	94 *24*	4812.4	(12^+)	
6371.7	(14)	364.9 *4*	100	6006.8	(13^+)	
7055.0	(15)	683.3 *4*	100	6371.7	(14)	
7791.8	(16)	736.8 *4*	100	7055.0	(15)	
8980.6		1188.8[b] *7*	100	7791.8	(16)	

$^{94}_{40}Zr_{54}$-5

Adopted Levels, Gammas (continued)

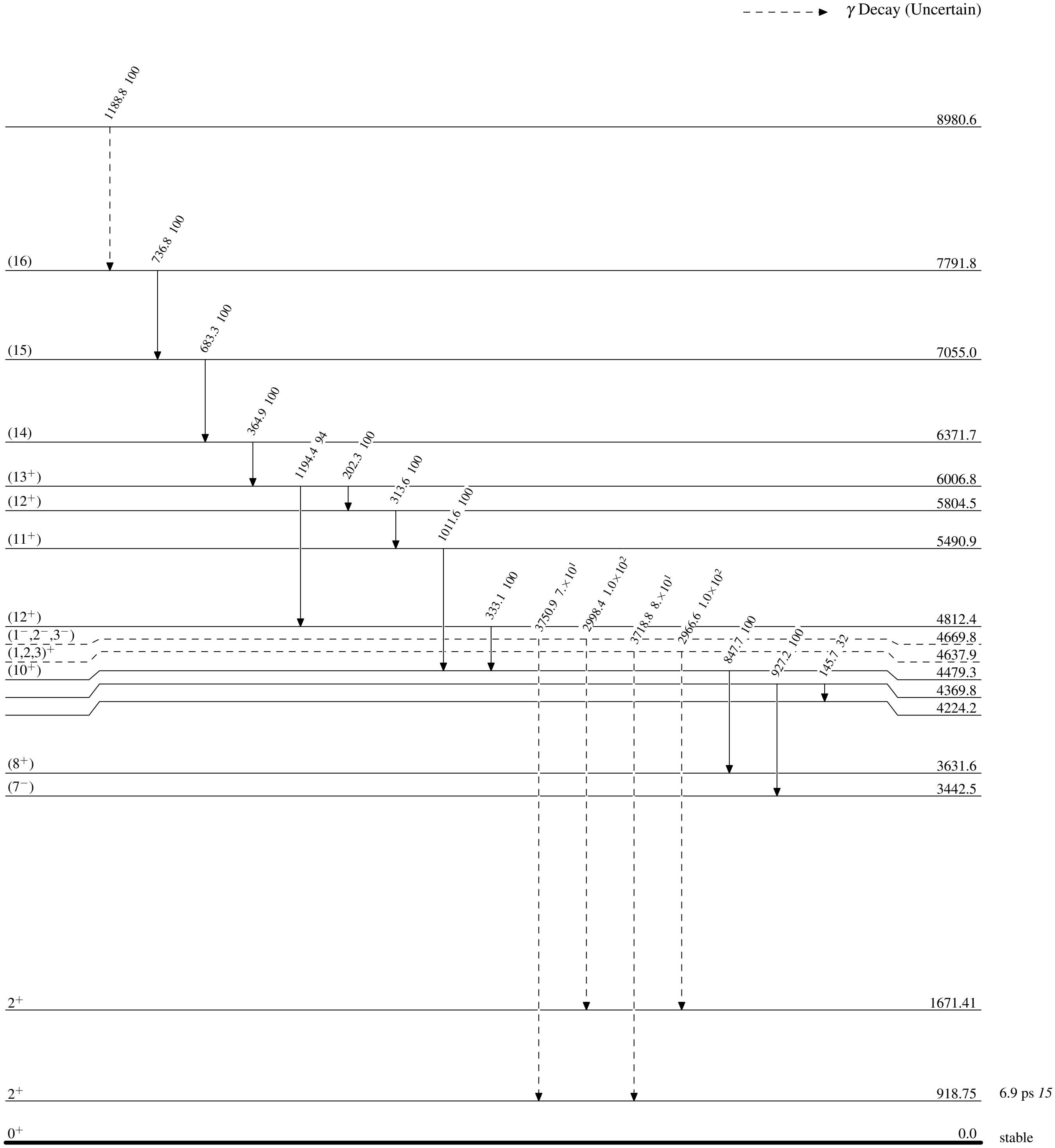
γ(^{94}Zr) (continued)

† Weighted averages from β^- decay and (n,n′γ).
‡ Branching ratios from each level deduced from β^- decay and (n,n′γ).
# Deduced from level energy difference.
@ From ^{94}Zr(p,p′γ).
& From ^{94}Zr(n,n′γ), unless noted otherwise.
[a] 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.
[b] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

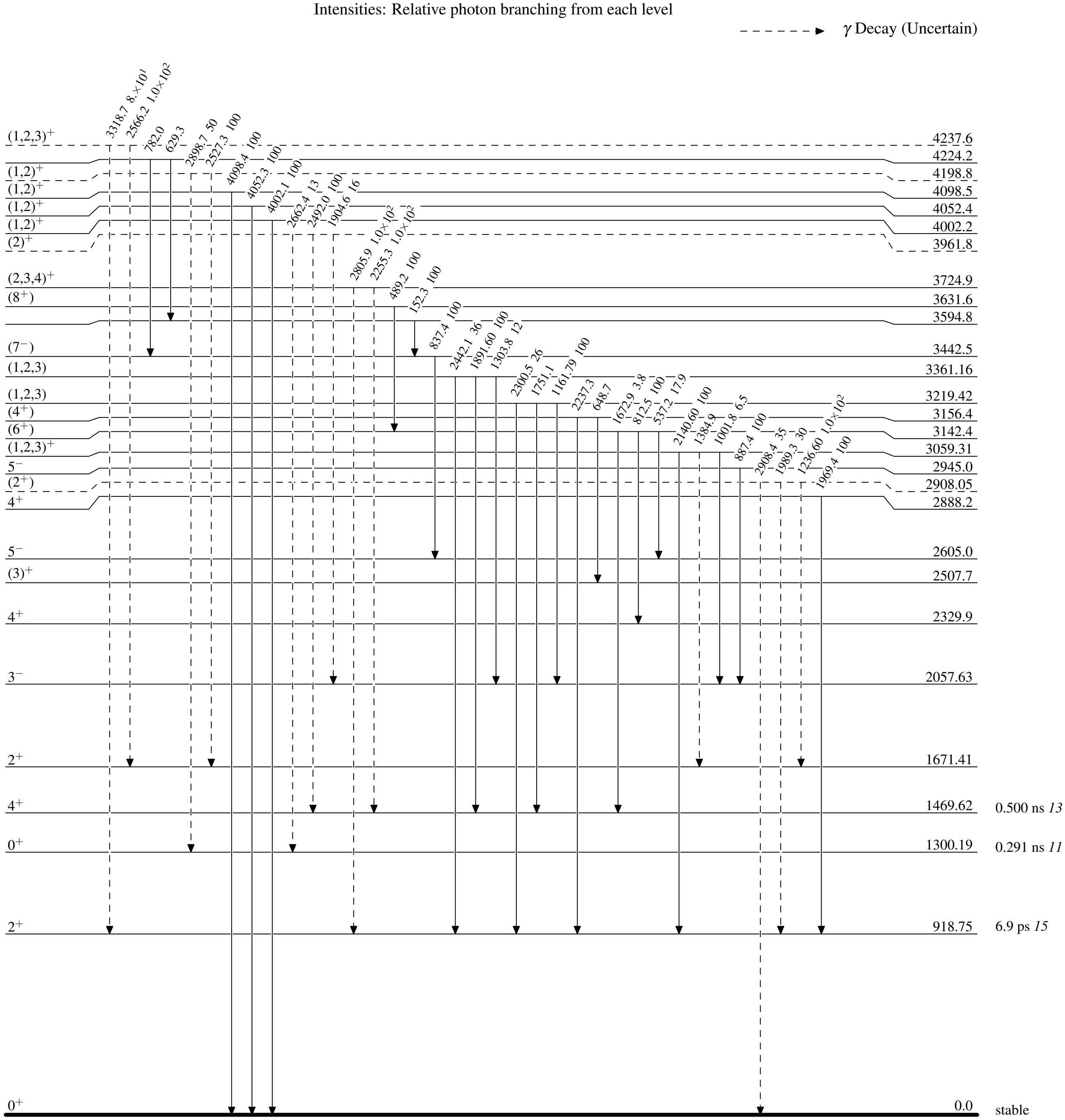


$^{94}_{40}Zr_{54}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

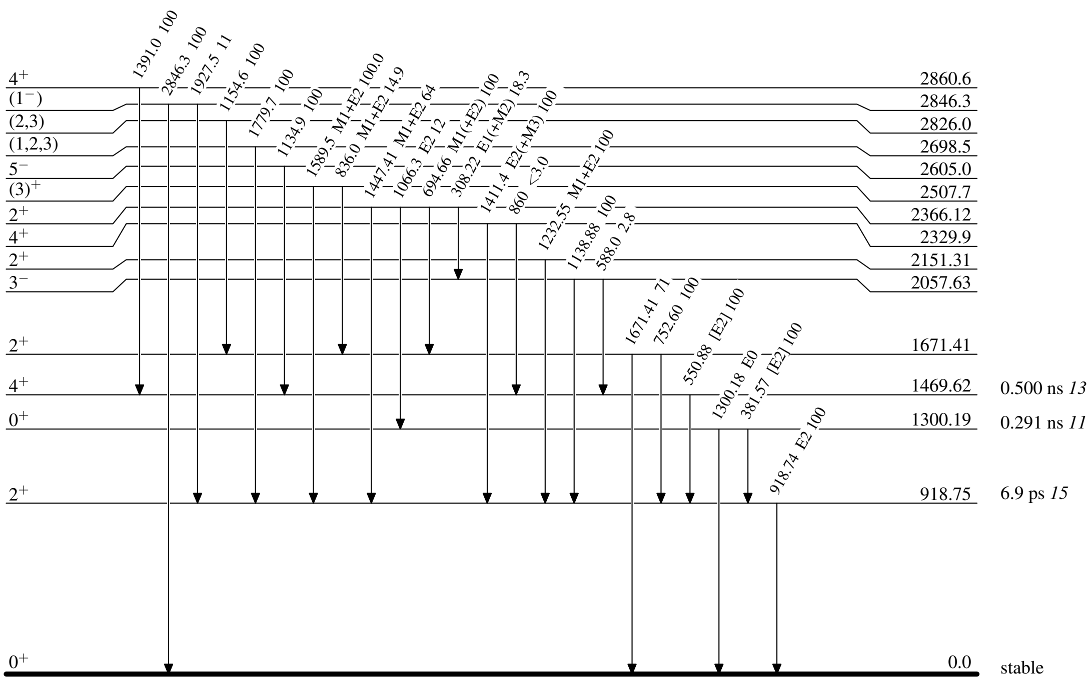


$^{94}_{40}Zr_{54}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{94}_{40}Zr_{54}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 109,2501 (2008)	1-Apr-2008

Q(β^-)=162 *4*; S(n)=7854.4 *21*; S(p)=11522 *7*; Q(α)=−5002 *4* 2012Wa38
Note: Current evaluation has used the following Q record 161 4 *7856.3* *2211525* 7 −5000 4 2003Au03.
Q($2\beta^-$)=3347.7 keV 22 (2003Au03).
Symbols and Abbreviations:
X_{ijk}=B(E0; $0^+_i \rightarrow 0^+_j$)/β(E2; $0^+_i \rightarrow 2^+_k$).
SPU=Single Particle Unit for E0 Transitions=0.5/$A^{(2/3)}$.
α: Additional information 1.

^{96}Zr Levels

With a ground state Q($2\beta^-$)=3347.7 keV 22 (2003Au03), there have been many experimental programs to determine the 2β- decay half life of ^{96}Zr. The adopted value comes from the latest results of the NEMO collaboration. A list of all experimental efforts can be found at www.nndc.bnl.gov/bbdecay.

Cross Reference (XREF) Flags

A	^{96}Y β^- decay (5.34 s)	G	^{96}Zr(p,p′γ)	M	Coulomb excitation
B	^{96}Y β^- decay (9.6 s)	H	^{96}Zr(d,d′), (pol d,d′)	N	^{98}Mo(^{6}Li,^{8}B), ^{96}Zr(^{6}Li,^{6}Li′)
C	^{96}Zr(n,n′γ)	I	^{96}Zr(t,t′)	O	^{100}Mo(d,^{6}Li)
D	^{94}Zr(t,p)	J	^{96}Zr(α,α′)	P	^{176}Yb(^{28}Si,Xγ)
E	^{94}Zr(t,pγ)	K	^{96}Zr(^{12}C,^{12}C′)	Q	^{96}Zr(^{32}S,^{32}S′γ)
F	^{96}Zr(p,p′)	L	^{96}Zr(^{16}O,^{16}O′)		

E(level)[†]	J^π	$T_{1/2}$	XREF	Comments
0.0	0^+	2.0×10^{19} y *4*	ABCDEFGHIJKLMNOPQ	$T_{1/2}$: from $T_{1/2}(2\nu2\beta)=2.0\times10^{19}$ y *3*(stat.) *2*(syst.), NEMO−3 Collaboration (2006Sh31,2005Sa07,2005Si06). Values from geochemical methods: $T_{1/2}=9.4\times10^{19}$ y *32* (2001Wi17), $T_{1/2}=3.9\times10^{19}$ y *9* (1993Ka12). Neutrino-less values from 1999Ar25, NEMO−2 Collaboration, 90% CL, $T_{1/2}(0\nu2\beta$, g.s. to g.s.)$>1.0\times10^{21}$ y, $T_{1/2}(0\nu2\beta$, g.s. to $2^+)>3.9\times10^{20}$ y. $<r^2>^{1/2}$(charge)=4.3498 *11* (2004An14).
1581.64[@] *6*	0^+	38.0 ns *7*	ABCDEFGH NO	J^π: E0 to 0^+. $T_{1/2}$: weighted average of 38.0 ns *15* (1972Bu18), 37.8 ns *12* (1972AnZZ), and 38.2 ns *12* (1971AnZF). 1971AnZF list their data as mean life; by comparing this group′s later measurement in 1972AnZZ, the evaluator has assumed that their result was $T_{1/2}$.
1750.497 *15*	2^+	0.57 ps *7*	ABCDEFGHIJKlMNOPQ	μ=+0.06 *14*; g=+0.03 *7* (2003Ku11) J^π: stretched E2 to 0^+. $T_{1/2}$: from DSAM following Coulomb excitation of ^{96}Zr beams (2003Ku11), other: 0.31 ps *13* from B(E2)=0.055 *22* (1965Ga05, Coulomb excitation).
1897.158[&] *16*	3^-	68 ps *4*	ABCDEFGHIJKl NOPQ	μ=+2.9 *5* (2003Ku11); g=+0.98 *15* J^π: L(α,α′)=3. $T_{1/2}$: from recoil distance measurement ^{96}Zr(^{32}S,^{32}S′γ) (1993Ho19). Other: 50 ps *7* from β decay of 5.34-s ^{96}Y (1990Ma45); 46 ps *15* from β decay of 9.6-s ^{96}Y (1990Oh02) both by the centroid-shift method.
2225.846[@] *17*	2^+	<10 ps	ABC EFGH O	$T_{1/2}$: from β decay of 5.34-s ^{96}Y (1990Ma45).

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Adopted Levels, Gammas (continued)

^{96}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$	XREF	Comments
				J^π: stretched E2 2226γ to 0^+.
2438.746 *18*	3^+	0.38 ps *+19−10*	C EFGHI	J=3 from $\gamma(\theta)$ in (n,n$'\gamma$); π=+ from M1 to 2^+. $T_{1/2}$: from (n,n$'\gamma$); value may be about 20% lower than indicated because cascade feeding was not considered.
2668.82 *4*	(2^+)	0.24 ps *+32−10*	A C EFGHI	J^π: L(p,p$'$)=(2). $T_{1/2}$: from (n,n$'\gamma$); value may be about 20% lower than indicated because cascade feeding was not considered.
2695.18 *3*	0^+	28 ps *7*	A C EFGH	J^π: E0 to 0^+. $T_{1/2}$: from β decay of 5.34-s ^{96}Y (1990Ma45).
2750 *15*	4^+		O	J^π: L(d,^{6}Li)=4.
2781.2? *10*			B	
2857.373[@] *23*	4^+	0.60[#] ps *+46−18*	BCDEFGHIJ OP	J^π: stretched E2 632γ to 2^+, L(d,d$'$)=4.
2925.55 *3*	0^+	20 ps *14*	A CDEFGH J	$T_{1/2}$: from β decay of 5.34-s ^{96}Y (1990Ma45); other: >1.4 ps (n,n$'\gamma$). J^π: E0 to 0^+; however, L=5 in (α,α') and (p,p$'$); 1990MoZY in (d,d$'$) did not observe L=5 at this energy. They suggest that L(α,α') and (L(p,p$'$) results may be due to an impurity.
3039 *5*	3^-		F	J^π: L(p,p$'$)=3.
3082.36 *3*	4^+	>1.4[#] ps	BCDEFGHIJ P	J^π: L(α,α')=4.
3119.87[&] *3*	5^-	0.58[#] ps *+68−21*	BC EFGHIJ P	J^π: stretched E2 1223γ to 3^-, E1 γ from 6^+.
3150.28 *3*	3^-	>0.54[#] ps	C EFGH	J=3 or 5 from $\gamma(\theta)$ in (n,n$'\gamma$); σ(n,n$'$) excludes J=5; π=− from M1 to 3^-.
3176.43 *3*	4^+	0.39[#] ps *+59−28*	BCDEFGH J	J^π: L(α,α')=4.
3211.84 *4*	2^+	0.090[#] ps *+21−14*	A C EFGHIJ	J^π: L(p,p$'$)=2.
3243.61 *7*		>0.097[#] ps	C	
3248.63 *5*	2^+	0.19[#] ps *+5−4*	C F H J	J^π: L(α,α')=2.
3309.19 *9*	$(4^+,5^+,6^+)$		BC EFGH P	J^π: E2 to 4^+ and γ to 5^-. L(p,p$'$)=4; however, this result is suspect because of 90Zr contaminant peak at 3308 keV. J^π(3309)=$(5,6)^-$ (1987StZX), 5^- (1988StZS) in the β decay of 9.6-s isomer of ^{96}Y; no experimental details available.
3363.30 *4*			C FGH	
3399 *11*	(4^+)		H	J^π: L(d,d$'$)=(4).
3427 *5*	4^+		F H J	J^π: L(p,p$'$)=4.
3448.72 *8*	(2^+)	>0.66[#] ps	C F H	J^π: L(p,p$'$)=(2).
3450.16 *17*			A F	
3457 *2*	(6^+)		F H	J^π: L(p,p$'$)=(6).
3472.14 *7*	2^+	0.15[#] ps *+4−2*	C F H j	J^π: L(p,p$'$)=2; 3482 *15* level in (α,α') has a L=(2) component.
3483.44[@] *9*	6^+	25 ps *9*	BCDEFGHIj P	$T_{1/2}$: from 9.6-s isomeric ^{96}Y β decay (1991OhZZ). J^π: E1 364γ to 5^-, L(p,p$'$)=6.
3509.16 *7*	2^+	0.104[#] ps *21*	A C FGH	J^π: L(p,p$'$)=2.
3556.18 *8*	2^+	0.16[#] ps *4*	C F HIJ	J^π: L(α,α')=2; L=5 in (t,t$'$) is probably wrong.
3577.62 *5*			C FGH	
3586 *2*	(4^-)		F H	J^π: from coupled-channels calculations in (p,p$'$).
3602.17 *20*	$(1,2^+)$[‡]	0.19[#] ps *+19−7*	C F H	
3608 *15*	$(5^-,6^+)$		J	J^π: L(α,α')=(5,6).
3611 *5*			F	J^π: L(p,p$'$)=(2,3,4).
3620.73 *7*	$(1,2^+)$[‡]	0.005[#] ps *3*	C H	

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Adopted Levels, Gammas (continued)

^{96}Zr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$	XREF	Comments
3630 *20*	(6+)		I	Jπ: L(t,t′)=(6).
3676 *5*			F HI	Jπ: L(p,p′)=5; L(d,d′)=(3,4,5); L(t,t′)=(2,3); could be a doublet.
3695 *5*			F J	Jπ: L(p,p′)=2; L(α,α′)=3.
3700.68 *10*	(1,2+)[‡]	0.006[#] ps *3*	A C H	
3732			F H	
3749.38 *10*	4+	>0.26[#] ps	BC EF HIJ	Jπ: L(p,p′)=L(t,t′)=4; note L(d,d′)=(4),5.
3761 *8*	2+		D I	Jπ: L(t,t′)=2.
3772.2 *4*	6+		B EF H P	Jπ: stretched E2 617γ from 8+, γ to 4+.
3833	4+		F H	Jπ: L(p,p′)=4.
3857.48 *20*	2+	0.055[#] ps *+21−14*	C F H	Jπ: L(p,p′)=2.
3865.16 *10*			C	
3895 *5*	4+		F	Jπ: L(p,p′)=4.
3924.6 *10*			B F HIJ	Jπ: L(t,t′)=5 and L(α,α′)=4.
3947.19 *10*	(1,2+)[‡]	0.010[#] ps *+6−4*	C F H	
3997	(2+)		F H	Jπ: L(p,p′)=(2).
4014.07 *20*	5−		C EFGH J	Jπ: L(p,p′)=5.
4024.5? *8*			A	
4034 *8*	3−		D F H	Jπ: L(p,p′)=3.
4037.89 *20*	(1,2+)[‡]	0.007[#] ps *+6−5*	C	
4038 *5*			F HI	Jπ: L(p,p′)=5 (1984FuZY); however, L(p,p′)=2 (1993Ho01).
4055 *5*	2+		F	Jπ: L(p,p′)=2.
4068 *2*	(1−)		F H	Jπ: L(p,p′)=(1).
4126.3 *10*	(4+)		B F HI	Jπ: L(t,t′)=(4).
4132.4 *3*	(1,2+)[‡]	<0.017[#] ps	C H	
4139 *5*	3−		F J	Jπ: L(α,α′)=3; however, L(p,p′)=(0,1,2).
4160	5−		I	Jπ: L(t,t′)=5.
4205 *5*	4+		F H	Jπ: L(p,p′)=4.
4234.7[&] *5*	7−		B EF H J P	Jπ: L(d,d′)=7.
4258.0 *4*	3−		A D H	Jπ: L(d,d′)=3.
4261.3 *5*	(5+,6+)		B	γ′s to 4+ and 6+, γ from (7+,8+), E=5066.2.
4323 *8*	(3−)		HI	Jπ: L(d,d′)=(3),(2). L(t,t′)=(3).
4341 *7*	2+		D F H J	Jπ: L(p,p′)=2.
4389.5 *5*	8+	127 ps *10*	B E P	Jπ: stretched E2 906γ to 6+, γ to 7−. $T_{1/2}$: from 9.6-s ^{96}Y β decay (1990OhZZ,1991OhZZ).
4390	(4+)		I	Jπ: L(t,t′)=4.
4430 *5*	6+		F H J	Jπ: L(α,α′)=6.
4470	5−		I	Jπ: L(t,t′)=5.
4479 *5*	4+		F	Jπ: L(p,p′)=4.
4512.5 *7*	(1,2+)[‡]		A H	
4520	(4+)		I	Jπ: L(t,t′)=(4).
4531 *6*	3−		H J	Jπ: L(α,α′)=3.
4570.1 *8*	(5−,6+)		B P	Jπ: gammas to 4+,7−.
4580	4+		I	Jπ: L(t,t′)=4.
4640 *8*			H J	
4689.7 *11*			B P	
4698 *5*	2+		F	Jπ: L(p,p′)=2.
4737.5 *8*	(1,2+)[‡]		A	
4751.5 *7*	(7,8+)		B I	Jπ: log $f^{1u}t$=7.6 for β− decay from (8+) parent; γ to 6+.
4757.2 *8*			B	
4807 *5*	3−		F IJ	Jπ: L(α,α′)=3.
4837.75 *20*	(1−,2+)		A F	Jπ: γ to 0+ and 3− levels; log *ft*=6.4 for β− decay from

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Adopted Levels, Gammas (continued)

^{96}Zr Levels (continued)

E(level)†	J$^{\pi}$	XREF	Comments
			0^{-} parent.
4845.4 *14*		B IJ	J$^{\pi}$: L(α,α')=3; L(t,t′)=4.
4881.9? *10*		A	
4895.2 *7*	(1,2^{+})‡	A F	
4906.9 *8*	(10^{+})	B P	
4914.1? *10*	(1,2^{+})‡	A	
4929.1 *9*	(1,2^{+})‡	A F J	
4979 *5*		F	
5014 *5*		F	
5065 *5*		F	
5066.2 *6*	(7^{+},8^{+})	B	J$^{\pi}$: log *ft*=5.7 for β^{-} decay from (8^{+}) parent; γ to 6^{+}.
5103 *15*		J	
5117.8 *11*		B F	
5196.9? *10*		A	
5228.5 *6*	(1,2^{+})‡	A	
5235.3 *8*	(7,8^{+})	B	J$^{\pi}$: log $f^{1u}t$=7.5 for β^{-} decay from (8^{+}); γ to 6^{+}.
5245 *5*		F	
5272.0 *6*	(1,2^{+})‡	A	
5312.5 *7*		A	
5329 *5*	4^{+}	F J	J$^{\pi}$: L(α,α')=4.
5371 *15*	4^{+}	J	J$^{\pi}$: L(α,α')=4.
5384 *5*		F	
5408.3 *7*		A	
5443.1 *5*	(1,2^{+})‡	A F	
5483.8 *11*	(10^{+})	P	J$^{\pi}$: γ to 8^{+}.
5502.2? *8*	(1,2^{+})‡	A	
5507.6 *5*	(7^{+},8^{+})	B	J$^{\pi}$: log *ft*=5.2 for β^{-} decay from (8^{+}); γ to 6^{+}.
5538.9 *6*	(1,2^{+})‡	A	
5551.6 *6*	(1,2^{+})‡	A	
5573.9 *6*	(1,2^{+})‡	A	
5601.5 *6*	(1,2^{+})‡	A	
5625.9 *10*		A	
5628.9 *11*		B	
5652.9? *10*		A	
5701.3 *6*		A	
5719.1 *8*	(1,2^{+})‡	A	
5737.7 *13*	(11^{+})	P	
5741.5? *10*		A	
5783.1 *8*	(1,2^{+})‡	A	
5804.5 *7*	(1,2^{+})‡	A	
5838.3 *10*	(1,2^{+})‡	A	
5847.5 *6*	(1,2^{+})‡	A	
5899.8 *11*		B	
5914.7 *6*	(1,2^{+})‡	A	
5934.6 *6*	(1,2^{+})‡	A	
6143.6? *8*	(1,2^{+})‡	A	
6231.6 *11*	(1,2^{+})‡	A	
6245.7 *16*	(12^{+})	P	
6460.5 *19*	(13^{+})	P	
6821.3 *22*	(14^{+})	P	

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Adopted Levels, Gammas (continued)

^{96}Zr Levels (continued)

† From a least-squares fit to the Eγ assuming ΔEγ=1 keV when unknown.
‡ γ to 0^+.
# From (n,n$'\gamma$).
@ Band(A): 4p-4h intruder band.
& Band(B): Negative parity sequence.

$\gamma(^{96}Zr)$

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.	δ	α	Comments
1581.64	0^+	1581.6 4		0.0	0^+	E0[#]			E_γ: from ^{96}Y β^- decay (5.34 s). $\rho^2=7.53\times10^{-3}$ 14=0.32 1(SPU); from t, K,L_I,L_{II} shell conversion factors from 1970Be87, and the K-shell conversion/pair production ratio from 1986PaZM.
1750.497	2^+	1750.42 2	100	0.0	0^+	E2		0.000398 6	α(K)=0.000184 3; α(L)=2.01×10^{-5} 3; α(M)=3.48×10^{-6} 5; α(N)=4.94×10^{-7} 7 α(O)=3.52×10^{-8} 5; α(N+..)=0.000190 3 B(E2)(W.u.)=2.3 3 Mult.: stretched Q from $\gamma\gamma(\theta)$ in β-decay; E2 from RUL.
1897.158	3^-	146.653[f] 10	100[f] 4	1750.497	2^+	(E1)		0.0371	α(K)=0.0327 5; α(L)=0.00366 6; α(M)=0.000632 9; α(N)=8.84×10^{-5} 13; α(O)=5.80×10^{-6} 9 α(N+..)=9.42×10^{-5} 14 B(E1)(W.u.)=0.00123 10 Mult.: stretched D from $\gamma\gamma(\theta)$ in β^- decay and ΔJ^π.
		1897.21[g] 3	19.0[g] 4	0.0	0^+	[E3]		0.000440 7	α(K)=0.000268 4; α(L)=2.97×10^{-5} 5; α(M)=5.14×10^{-6} 8; α(N)=7.31×10^{-7} 11 α(O)=5.17×10^{-8} 8; α(N+..)=0.0001367 20 B(E3)(W.u.)=57 4 $I\gamma$(147) and $I\gamma$(1897): weighted average of (p,p′γ), (n,n′γ) and β-decay(5.34 s) data sets.
2225.846	2^+	328.75 3	14[b] 1	1897.158	3^-	(E1(+M2))	−0.02[@] 5	0.00380 16	α(K)=0.00336 14; α(L)=0.000371 17; α(M)=6.4×10^{-5} 3; α(N)=9.1×10^{-6} 5; α(O)=6.2×10^{-7} 3 α(N+..)=9.7×10^{-6} 5 B(E1)(W.u.)>6.4×10^{-5} Mult.: from $\gamma(\theta)$ in (n,n′γ) and ΔJ^π.
		475.33 1	57[b] 1	1750.497	2^+	M1+E2	−0.09[@] +1−2	0.00361 5	α(K)=0.00318 5; α(L)=0.000355 5; α(M)=6.16×10^{-5} 9; α(N)=8.76×10^{-6} 13; α(O)=6.19×10^{-7} 9 α(N+..)=9.38×10^{-6} 14 B(E2)(W.u.)>0.16; B(M1)(W.u.)>0.0058 Mult.: from $\gamma(\theta)$ in (n,n′γ) and ce data in (t,pγ).
		644.18 6	28[b] 2	1581.64	0^+	E2		0.00203 3	α(K)=0.001783 25; α(L)=0.000204 3; α(M)=3.53×10^{-5} 5; α(N)=4.98×10^{-6} 7; α(O)=3.37×10^{-7} 5 α(N+..)=5.31×10^{-6} 8 B(E2)(W.u.)>2.7 Mult.: Q from $\gamma(\theta)$ in (n,n′γ); E2 from RUL.
		2225.93 4	100[b] 5	0.0	0^+	E2		0.000550 8	α(K)=0.0001185 17; α(L)=1.283×10^{-5} 18; α(M)=2.22×10^{-6} 4 α(O)=2.26×10^{-8} 4; α(N+..)=0.000417 6

From ENSDF

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ	E_f	J^π_f	Mult.	δ	α	$I_{(\gamma+ce)}$	Comments
										B(E2)(W.u.)>0.020 Mult.: Q from $\gamma(\theta)$ in (n,n′γ); E2 from RUL.
2438.746	3^+	688.25 *1*	100	1750.497	2^+	M1+E2	+0.02[@] *+2−1*	0.001529 *22*		α(K)=0.001350 *19*; α(L)=0.0001491 *21*; α(M)=2.59×10^{-5} *4* α(O)=2.62×10^{-7} *4*; α(N+..)=3.94×10^{-6} *6* B(E2)(W.u.)=0.1 *+3−1*; B(M1)(W.u.)=0.18 *+5−9* Mult.: from (n,n′γ).
2668.82	(2^+)	442.9 *3*	6.4[c] *16*	2225.846	2^+					
		771.60 *4*	35[c] *5*	1897.158	3^-	(E1+M2)	+0.08[@] *+6−7*	0.00050 *4*		α(K)=0.00044 *3*; α(L)=4.8×10^{-5} *4*; α(M)=8.4×10^{-6} *6*; α(N)=1.19×10^{-6} *9*; α(O)=8.4×10^{-8} *6* α(N+..)=1.28×10^{-6} *10* B(E1)(W.u.)=(0.0007 *+4−7*); B(M2)(W.u.)=(4.E+1 *+6−4*) Mult.: from $\gamma(\theta)$ in (n,n′γ) and ΔJ^π.
		918.6 *1*	100[c] *5*	1750.497	2^+	M1,E2[&]		0.000813 *13*		α(K)=0.000718 *11*; α(L)=7.95×10^{-5} *16*; α(M)=1.38×10^{-5} *3*; α(N)=1.96×10^{-6} *4* α(O)=1.377×10^{-7} *20*; α(N+..)=2.09×10^{-6} *4* B(E2)(W.u.)=5.E+1 *7*; B(M1)(W.u.)=0.04 *6*
2695.18	0^+	469.33 *3*	100	2225.846	2^+	[E2]		0.00507 *8*		α(K)=0.00445 *7*; α(L)=0.000522 *8*; α(M)=9.06×10^{-5} *13*; α(N)=1.269×10^{-5} *18*; α(O)=8.30×10^{-7} *12* α(N+..)=1.352×10^{-5} *19* B(E2)(W.u.)=34 *9*
		1113.53[‡]		1581.64	0^+	E0[#]			0.018	$I_{(\gamma+ce)}$: ce(K)(1114)/I(469γ)=0.00015 to 0.00018 in (t,pγ). X_{322}=0.037 *6* (if 1114.6γ is M1 or E2), =0.043 *7* (if 1114.6γ is E1) (1988HeZM).
		2695.17[‡]		0.0	0^+	E0[#]			0.0030	$I_{(\gamma+ce)}$: from ce(K)(2695)/I(469γ)=0.000030 in (t,pγ). X_{312}=0.0039 *9* (1988HeZM); statistical uncertainty only, a calibration uncertainty of 50% for E_e>1600 keV is not included. ρ^2_{32}/ρ^2_{31}=9.4 *26* (1988HeZM).
2781.2?		884.0[i]	100	1897.158	3^-					
2857.373	4^+	631.45[e] *4*	21[de] *4*	2225.846	2^+	E2(+M3)[a]	−0.02[@] *8*	0.00215 *12*		α(K)=0.00189 *11*; α(L)=0.000216 *13*; α(M)=3.75×10^{-5} *22*; α(N)=5.3×10^{-6} *4*; α(O)=3.56×10^{-7} *21*

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.	δ	α	Comments
									α(K)=0.00189 *11*; α(L)=0.000216 *13*; α(M)=3.75×10^{-5} *22*; α(N)=5.3×10^{-6} *4*; α(O)=3.56×10^{-7} *21* α(N+..)=5.6×10^{-6} *4* B(E2)(W.u.)=(56 *+20−44*)
2857.373	4$^+$	960.9[e] *2*	15[de] *4*	1897.158	3$^-$	(E1)		0.000311 *5*	α(K)=0.000275 *4*; α(L)=2.99×10^{-5} *5*; α(M)=5.18×10^{-6} *8*; α(N)=7.36×10^{-7} *11* α(O)=5.22×10^{-8} *8*; α(N+..)=7.88×10^{-7} *11* B(E1)(W.u.)=7.E−5 *+3−6* Mult.: stretched D from $\gamma\gamma(\theta)$ in β^- decay and ΔJ^π.
		1106.88[e] *2*	100[de] *6*	1750.497	2$^+$	E2(+M3)[a]	−0.03[@] *3*	0.000536 *10*	α(K)=0.000472 *8*; α(L)=5.23×10^{-5} *9*; α(M)=9.06×10^{-6} *16*; α(O)=9.01×10^{-8} *16* α(N+..)=2.18×10^{-6} *4* B(E2)(W.u.)=(16 *+5−13*); B(M3)(W.u.)=(8.E+4 *+17−8*)
2925.55	0$^+$	230.38[‡]		2695.18	0$^+$	E0[#]			X_{432}<2.8 (2σ) (1988HeZM).
		699.9[f] *3*	40[f] *3*	2225.846	2$^+$	(E2)		0.001621 *23*	α(K)=0.001427 *20*; α(L)=0.0001620 *23*; α(M)=2.81×10^{-5} *4* α(O)=2.70×10^{-7} *4*; α(N+..)=4.24×10^{-6} *6* B(E2)(W.u.)=1.8 *14* Mult.: ce data in (t,pγ) give M1,E2; ΔJ rules out M1.
		1175.04 *3*	100 *15*	1750.497	2$^+$	(E2)		0.000473 *7*	α(K)=0.000413 *6*; α(L)=4.56×10^{-5} *7*; α(M)=7.90×10^{-6} *11*; α(N)=1.121×10^{-6} *16* α(O)=7.88×10^{-8} *11*; α(N+..)=6.07×10^{-6} *9* B(E2)(W.u.)=0.3 *3* Mult.: ce data in (t,pγ) give M1/E2; ΔJ rules out M1.
		1343.89[‡]		1581.64	0$^+$	E0[#]			X_{422}<0.119 (2σ) (1988HeZM).
		2925.50[‡]		0.0	0$^+$	E0[#]			X_{412}=0.067 *27* (1988HeZM); statistical uncertainty only; a calibration uncertainty of 50% for E_e>1600 keV is not included. ρ^2_{42}/ρ^2_{41}<3.0 (1988HeZM).
3082.36	4$^+$	224.8	10.3	2857.373	4$^+$				E_γ: observed only in ^{96}Y β^- Decay (9.6 s).
		643.9[h] *2*	7.1[h] *8*	2438.746	3$^+$				
		856.6[h] *2*	6.3[h] *13*	2225.846	2$^+$	[E2]		0.000969 *14*	α(K)=0.000854 *12*; α(L)=9.57×10^{-5} *14*; α(M)=1.660×10^{-5} *24* α(O)=1.624×10^{-7} *23*; α(N+..)=2.51×10^{-6} *4* B(E2)(W.u.)<1.6
		1185.19[g] *3*	100.0[g] *13*	1897.158	3$^-$	E1(+M2)[&]	+0.02[@] *3*	0.000244 *4*	α(K)=0.000186 *3*; α(L)=2.02×10^{-5} *4*; α(M)=3.49×10^{-6} *6*; α(N)=4.96×10^{-7} *9* α(O)=3.53×10^{-8} *6*; α(N+..)=3.44×10^{-5} *5* B(E1)(W.u.)<0.00010; B(M2)(W.u.)<0.54

$^{96}_{40}Zr_{56}$-8

Adopted Levels, Gammas (continued)

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.	δ	α	Comments
3082.36	4^+	1331.8[h] *2*	10.1[h] *13*	1750.497	2^+				
3119.87	5^-	1222.70 *3*	100	1897.158	3^-	E2+M3[&]	−0.05[@] *3*	0.000444 *9*	α(K)=0.000383 *8*; α(L)=4.22×10^{-5} *9*; α(M)=7.31×10^{-6} *15*; α(N)=1.037×10^{-6} *21* α(O)=7.31×10^{-8} *15*; α(N+..)=1.245×10^{-5} *18* B(E2)(W.u.)=14 *+5−14*; B(M3)(W.u.)=1.6×10^5 *+20−16*
3150.28	3^-	711.56 *3*	100 *4*	2438.746	3^+	(E1+M2)	−0.07[@] *4*	0.000593 *25*	α(K)=0.000524 *22*; α(L)=5.7×10^{-5} *3*; α(M)=9.9×10^{-6} *5*; α(N)=1.41×10^{-6} *7* α(O)=9.9×10^{-8} *5*; α(N+..)=1.51×10^{-6} *7* B(E1)(W.u.)<0.00100; B(M2)(W.u.)<94 Mult.: from $\gamma(\theta)$ in (n,n′γ) and ΔJ^π. E_γ: from (n,n′γ). I_γ: from (p,p′γ).
		1252.98 *7*	66 *7*	1897.158	3^-	M1+E2	+1.7[@] *3*	0.000427 *6*	α(K)=0.000363 *6*; α(L)=3.98×10^{-5} *6*; α(M)=6.90×10^{-6} *10*; α(N)=9.81×10^{-7} *14* α(O)=6.95×10^{-8} *10*; α(N+..)=1.70×10^{-5} *4* B(E2)(W.u.)<4.2; B(M1)(W.u.)<0.0027 Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); M1+E2 from RUL. E_γ: from (n,n′γ). I_γ: from (p,p′γ).
3176.43	4^+	1279.27[h] *2*	100.0[h] *19*	1897.158	3^-	E1(+M2)[&]	−0.03[@] *3*	0.000277 *5*	α(K)=0.000163 *3*; α(L)=1.76×10^{-5} *3*; α(M)=3.05×10^{-6} *6*; α(N)=4.34×10^{-7} *8* α(O)=3.09×10^{-8} *6*; α(N+..)=9.37×10^{-5} *14* B(E1)(W.u.)=(0.0004 *+3−4*); B(M2)(W.u.)=(1.0 *+21−10*)
		1425.6[h] *2*	4.7[h] *9*	1750.497	2^+	[E2]		0.000371 *6*	α(K)=0.000276 *4*; α(L)=3.02×10^{-5} *5*; α(M)=5.23×10^{-6} *8*; α(N)=7.43×10^{-7} *11* α(O)=5.27×10^{-8} *8*; α(N+..)=5.96×10^{-5} *9* B(E2)(W.u.)=0.4 *+4−4*
3211.84	2^+	1314.64 *4*	100 *11*	1897.158	3^-				
		1461.5 *1*	54 *11*	1750.497	2^+				
		3211.8 *1*	64 *18*	0.0	0^+				
3243.61		574.74 *6*	100 *25*	2668.82	(2^+)				
		1018.3 *2*	100 *25*	2225.846	2^+				
3248.63	2^+	1022.8 *1*	22 *5*	2225.846	2^+				
		3248.56 *6*	100 *11*	0.0	0^+	[E2]		0.000950 *14*	α(K)=6.22×10^{-5} *9*; α(L)=6.70×10^{-6} *10*; α(M)=1.159×10^{-6} *17* α(O)=1.188×10^{-8} *17*; α(N+..)=0.000880 *13* B(E2)(W.u.)=0.26 *+7−8*

$^{96}_{40}Zr_{56}$-9

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ	E_f	J^π_f	Mult.	α	Comments
3309.19	(4+,5+,6+)	132.9	62.5	3176.43	4+			
		189.4	25	3119.87	5−			
		226.82 8	100	3082.36	4+	E2[&]	0.0573	α(K)=0.0496 7; α(L)=0.00646 9; α(M)=0.001124 16; α(N)=0.0001541 22; α(O)=8.79×10⁻⁶ 13 α(N+..)=0.0001629 23
3363.30		924.55 4	100	2438.746	3+			
3448.72	(2+)	780.2 2	100 19	2668.82	(2+)			
		1551.50 8	75 19	1897.158	3−			
3450.16		781.2[f] 2	100[f] 15	2668.82	(2+)			
		1225.2[f] 5	12[f] 5	2225.846	2+			
		1699.6[f] 4	60[f] 15	1750.497	2+			
3472.14	2+	3472.07 7	100	0.0	0+	[E2]	0.001033 15	α(K)=5.59×10⁻⁵ 8; α(L)=6.01×10⁻⁶ 9; α(M)=1.040×10⁻⁶ 15 α(O)=1.066×10⁻⁸ 15; α(N+..)=0.000971 14 B(E2)(W.u.)=0.29 +4−8
3483.44	6+	173.7[e]	9.4[e]	3309.19	(4+,5+,6+)	(M1)	0.0452	α(K)=0.0397 6; α(L)=0.00456 7; α(M)=0.000793 12; α(N)=0.0001124 16; α(O)=7.81×10⁻⁶ 11 α(N+..)=0.0001202 17 B(M1)(W.u.)=0.014 5 Mult.: this γ is designated as E1 (1987StZX,1988StZS) without giving experimental details for this assignment. If this γ is a dipole, it should be M1.
		363.58[e] 8	100[e]	3119.87	5−	E1[&]	0.00290 4	α(K)=0.00256 4; α(L)=0.000283 4; α(M)=4.89×10⁻⁵ 7; α(N)=6.92×10⁻⁶ 10; α(O)=4.77×10⁻⁷ 7 α(N+..)=7.39×10⁻⁶ 11 B(E1)(W.u.)=0.00023 9
		401.0[e]	1.17[e]	3082.36	4+			
		626[e]	3.1[e]	2857.373	4+			I_γ: from 1987St12 Iin ^{96}Y β^- decay (9.6 s); 626γ is not shown in 1987StZX.
3509.16	2+	1283.1 1	33 3	2225.846	2+			
		1612.1 1	100 3	1897.158	3−			
		1759.0 2	17 3	1750.497	2+			
3556.18	2+	3556.11 8	100	0.0	0+	[E2]	0.001064 15	α(K)=5.38×10⁻⁵ 8; α(L)=5.78×10⁻⁶ 8; α(M)=1.000×10⁻⁶ 14 α(O)=1.026×10⁻⁸ 15; α(N+..)=0.001004 14 B(E2)(W.u.)=0.24 6
3577.62		1138.87 5	100	2438.746	3+			
3602.17	(1,2+)	3602.1 2	100	0.0	0+			
3620.73	(1,2+)	3620.66 7	100	0.0	0+			
3700.68	(1,2+)	3700.6[f] 1	100[f]	0.0	0+			
3749.38	4+	1852.2 1	100	1897.158	3−			

$^{96}_{40}Zr_{56}$-10

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ	E_f	J^π_f	Mult.	δ	α	Comments
3772.2	6^+	289.0[e]	1.49[e]	3483.44	6^+	(M1(+E2))	−0.4 *5*	0.014 *4*	α(K)=0.012 *4*; α(L)=0.0014 *5*; α(M)=0.00024 *8*; α(N)=3.5×10^{-5} *11*; α(O)=2.3×10^{-6} *6* α(N+..)=3.7×10^{-5} *12* Mult.: from $\gamma(\theta)$ and ΔJ^π. δ: from $\gamma(\theta)$ in ^{96}y β^- decay (9.6 s).
		462.7[e]	0.75[e]	3309.19	$(4^+,5^+,6^+)$				
		652.1[e]	2.5[e]	3119.87	5^-	(E1)		0.000698 *10*	α(K)=0.000617 *9*; α(L)=6.75×10^{-5} *10*; α(M)=1.169×10^{-5} *17* α(O)=1.165×10^{-7} *17*; α(N+..)=1.775×10^{-6} *25* Mult.: stretched D from $\gamma\gamma(\theta)$ in β^- decay and ΔJ^π.
		690.0[e]	1.94[e]	3082.36	4^+				
		914.8[e]	100[e]	2857.373	4^+	(E2)		0.000827 *12*	α(K)=0.000729 *11*; α(L)=8.14×10^{-5} *12*; α(M)=1.412×10^{-5} *20* α(O)=1.388×10^{-7} *20*; α(N+..)=2.14×10^{-6} *3* Mult.: stretched Q from $\gamma\gamma(\theta)$ in β-decay and ΔJ^π.
3857.48	2^+	3857.4 *2*	100	0.0	0^+	[E2]		0.001166 *17*	α(K)=4.73×10^{-5} *7*; α(L)=5.08×10^{-6} *8*; α(M)=8.78×10^{-7} *13*; α(N)=1.252×10^{-7} *18* α(O)=9.02×10^{-9} *13*; α(N+..)=0.001113 *16* B(E2)(W.u.)=0.46 *+12−18*
3865.16		1426.4 *1*	100	2438.746	3^+				
3924.6		804.7[e]	100[e]	3119.87	5^-				
3947.19	$(1,2^+)$	3947.1 *1*	100	0.0	0^+				
4014.07	5^-	894.2 *2*	100	3119.87	5^-				
4024.5?		2274.0[i] *8*	100	1750.497	2^+				
4037.89	$(1,2^+)$	4037.8 *2*	100	0.0	0^+				
4126.3	(4^+)	1006.4[e]	100[e]	3119.87	5^-				
4132.4	$(1,2^+)$	4132.3 *3*	100	0.0	0^+				
4234.7	7^-	751.5[e]	40[e]	3483.44	6^+				
		1114.6[e]	100[e]	3119.87	5^-				
4258.0	3^-	1332.4[f] *4*	100[f]	2925.55	0^+				
4261.3	$(5^+,6^+)$	489.0	85	3772.2	6^+				
		778.0	100	3483.44	6^+				
		1179.0	23	3082.36	4^+				
4389.5	8^+	154.7[e]	0.8[e]	4234.7	7^-	[E1]		0.0317	α(K)=0.0280 *4*; α(L)=0.00313 *5*; α(M)=0.000540 *8*; α(N)=7.57×10^{-5} *11*; α(O)=4.99×10^{-6} *7* α(N+..)=8.07×10^{-5} *12* B(E1)(W.u.)=4.0×10^{-6} *4*
		617.2[e]	100[e]	3772.2	6^+	E2		0.00228 *4*	α(K)=0.00201 *3*; α(L)=0.000230 *4*; α(M)=3.99×10^{-5} *6*;

$^{96}_{40}Zr_{56}$-11

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ	E_f	J^π_f	Mult.	α	Comments
								α(N)=5.61×10^{-6} 8; α(O)=3.78×10^{-7} 6 α(N+..)=5.99×10^{-6} 9 B(E2)(W.u.)=1.38 11 Mult.: stretched Q from $\gamma\gamma(\theta)$ in β^- decay; E2 from RUL.
4389.5	8$^+$	906.2[e]	36.8[e]	3483.44	6$^+$	E2	0.000846 12	α(K)=0.000746 11; α(L)=8.33×10^{-5} 12; α(M)=1.445×10^{-5} 21 α(O)=1.419×10^{-7} 20; α(N+..)=2.19×10^{-6} 3 B(E2)(W.u.)=0.075 6 Mult.: stretched Q from $\gamma\gamma(\theta)$ in β^- decay; E2 from RUL.
4512.5	(1,2$^+$)	4512.4 7	100	0.0	0$^+$			
4570.1	(5$^-$,6$^+$)	335.4[e]	60[e]	4234.7	7$^-$			
		1712.7[i]	100	2857.373	4$^+$			
4689.7		455.0	100	4234.7	7$^-$			
4737.5	(1,2$^+$)	4737.4 8	100	0.0	0$^+$			
4751.5	(7,8$^+$)	979.2	100	3772.2	6$^+$			
4757.2		522.6	100	4234.7	7$^-$			
4837.75	(1$^-$,2$^+$)	1625.8[f] 4	99[f] 30	3211.84	2$^+$			
		1912.1[f] 4	35[f] 8	2925.55	0$^+$			
		2940.0[f] 4	59[f] 15	1897.158	3$^-$			
		3086.9[f] 7	45[f] 7	1750.497	2$^+$			
		3257.4[f] 7	36[f] 8	1581.64	0$^+$			
		4839.2[f] 8	100[f] 19	0.0	0$^+$			
4845.4		719.1[e]	100[e]	4126.3	(4$^+$)			
4881.9?		1956.3[i] 10	100	2925.55	0$^+$			
4895.2	(1,2$^+$)	4895.1[f] 7	100[f]	0.0	0$^+$			
4906.9	(10$^+$)	517.4	100	4389.5	8$^+$			
4914.1?	(1,2$^+$)	4914.0[i] 10	100	0.0	0$^+$			
4929.1	(1,2$^+$)	4929.0[f] 9	100[f]	0.0	0$^+$			
5066.2	(7$^+$,8$^+$)	314.7	38.9	4751.5	(7,8$^+$)			
		676.7	22.2	4389.5	8$^+$			
		804.9	77.8	4261.3	(5$^+$,6$^+$)			
		1582.9	100	3483.44	6$^+$			
5117.8		728.3	100	4389.5	8$^+$			
5196.9?		3615.2[i] 10	100	1581.64	0$^+$			
5228.5	(1,2$^+$)	5228.3 6	100	0.0	0$^+$			
5235.3	(7,8$^+$)	845.8	100	4389.5	8$^+$			
		1463.0	71	3772.2	6$^+$			
5272.0	(1,2$^+$)	5271.8 6	100	0.0	0$^+$			
5312.5		3730.8 7	100	1581.64	0$^+$			

From ENSDF

$^{96}_{40}Zr_{56}$-12

Adopted Levels, Gammas (continued)

$\gamma(^{96}Zr)$ (continued)

E_i(level)	J^{π}_i	E_γ[†]	I_γ	E_f	J^{π}_f
5408.3		3826.6 *7*	100	1581.64	0^+
5443.1	$(1,2^+)$	3861.7[f] *6*	100[f] *11*	1581.64	0^+
		5442.5[f] *7*	36[f] *5*	0.0	0^+
5483.8	(10^+)	1094.3	100	4389.5	8^+
5502.2?	$(1,2^+)$	5502.0[i] *8*	100	0.0	0^+
5507.6	$(7^+,8^+)$	441.4	27	5066.2	$(7^+,8^+)$
		600.7	33	4906.9	(10^+)
		750.5	33	4757.2	
		756.1	73	4751.5	$(7,8^+)$
		1118.1	100	4389.5	8^+
		1246.3	60	4261.3	$(5^+,6^+)$
		1735.3	80	3772.2	6^+
5538.9	$(1,2^+)$	5538.7 *6*	100	0.0	0^+
5551.6	$(1,2^+)$	5551.4 *6*	100	0.0	0^+
5573.9	$(1,2^+)$	3992.2 *8*	73	1581.64	0^+
		5573.7 *8*	100	0.0	0^+
5601.5	$(1,2^+)$	5601.3 *6*	100	0.0	0^+
5625.9		4044.2 *10*	100	1581.64	0^+
5628.9		1239.4	100	4389.5	8^+
5652.9?		4071.2[i] *10*	100	1581.64	0^+
5701.3		4119.6 *6*	100	1581.64	0^+
5719.1	$(1,2^+)$	5718.9 *8*	100	0.0	0^+
5737.7	(11^+)	830.8	100	4906.9	(10^+)
5741.5?		4159.8[i] *10*	100	1581.64	0^+
5783.1	$(1,2^+)$	5782.9 *8*	100	0.0	0^+
5804.5	$(1,2^+)$	5804.3 *7*	100	0.0	0^+
5838.3	$(1,2^+)$	5838.1 *10*	100	0.0	0^+
5847.5	$(1,2^+)$	5847.3 *6*	100	0.0	0^+
5899.8		1510.3	100	4389.5	8^+
5914.7	$(1,2^+)$	4162.9 *10*	100 *19*	1750.497	2^+
		4334.2[i] *15*	19 *5*	1581.64	0^+
		5914.9 *8*	97 *17*	0.0	0^+
5934.6	$(1,2^+)$	5934.4 *6*	100	0.0	0^+
6143.6?	$(1,2^+)$	4562.7[i] *10*	$6.\times10^1$ *3*	1581.64	0^+
		6141.6 *14*	1.0×10^2 *3*	0.0	0^+
6231.6	$(1,2^+)$	6231.4 *11*	100	0.0	0^+
6245.7	(12^+)	508.0	100	5737.7	(11^+)
6460.5	(13^+)	214.8	100	6245.7	(12^+)
6821.3	(14^+)	360.8	100	6460.5	(13^+)

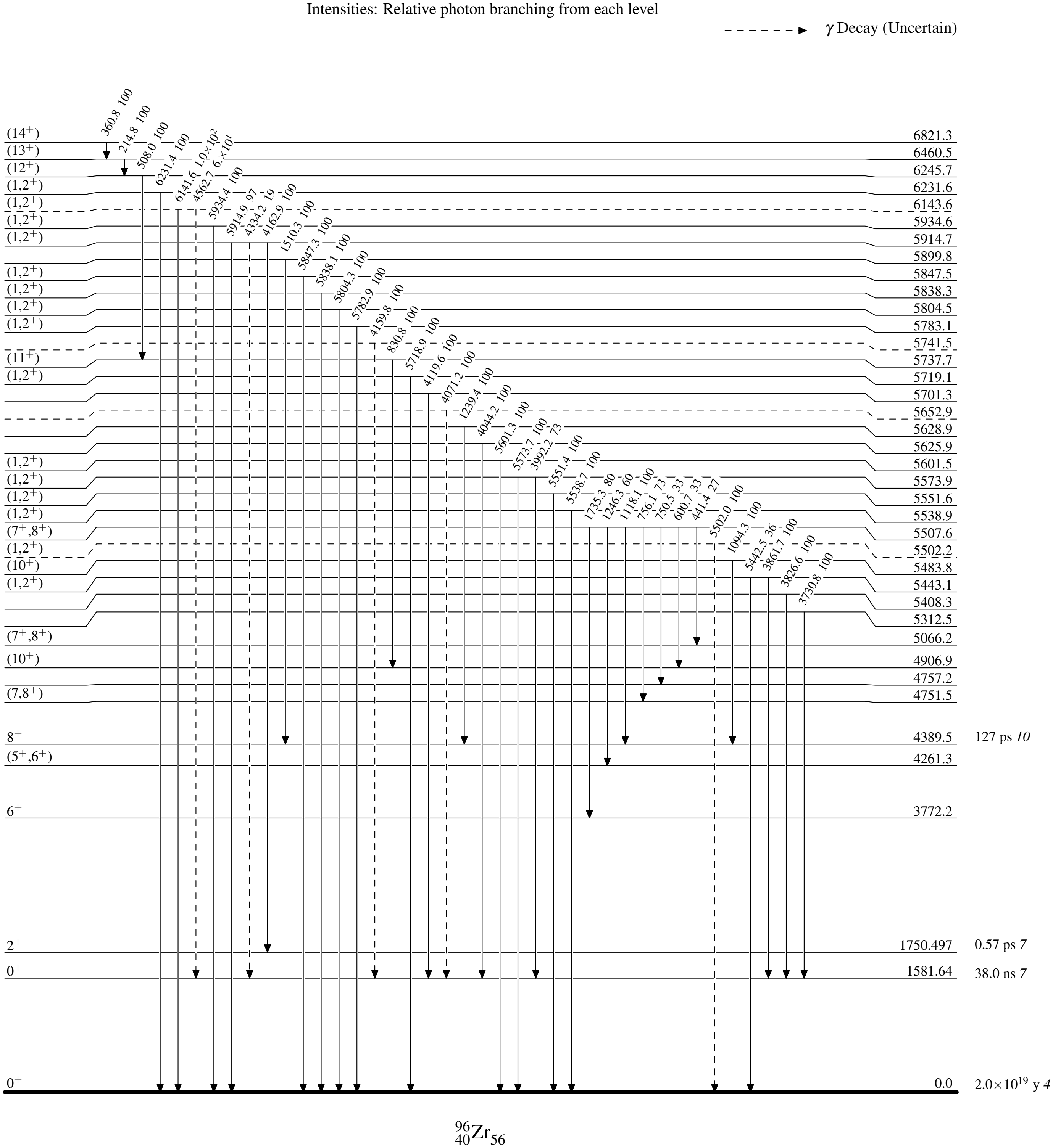
† From the following data sets: ^{96}Y β^- decay (5.43 s),(9.6 s), (n,n′γ), (p,p′γ).
‡ From difference in energies of initial and final levels.
\# ce data and no γ observed (1988Ma01,1990Ma03,1986HeZP,1988HeZM).
@ From γ(θ) in (n,n′γ).
& From ce data in (t,pγ).
a From γ(θ) in (n,n′γ) and RUL.
b From (n,n′γ); Iγ(329:475:644:2226)=16.1 *6*:58.4 *22*:21.9 *7*:100 *6* (β^- decay 5.34 s) 9.5:56:27:100 (β^- decay 9.6 s), and 7.6 *6*:44.4 *12*:22.8 *8*:100 *4* (p,p′γ).
c From (n,n′γ); Iγ(443:772:919)=−:20 *3*:100 *6* (β^- decay 5.34 s), -:23.0 *16*:100 *3* (p,p′γ).
d From (n,n′γ); Iγ(632:962:1107)=16:8:100 (β^- decay 9.6 s), 16:-:100 (t,pγ), 11.5 *22*:-:100 *4* (p,p′γ).
e From ^{96}Y β^- decay (9.6 s).
f From ^{96}Y β^- decay (5.34 s).
g From ^{96}Zr(n,n′γ).
h From ^{96}Zr(p,p′γ).
i Placement of transition in the level scheme is uncertain.

$^{96}_{40}Zr_{56}$-13

Adopted Levels, Gammas

Level Scheme

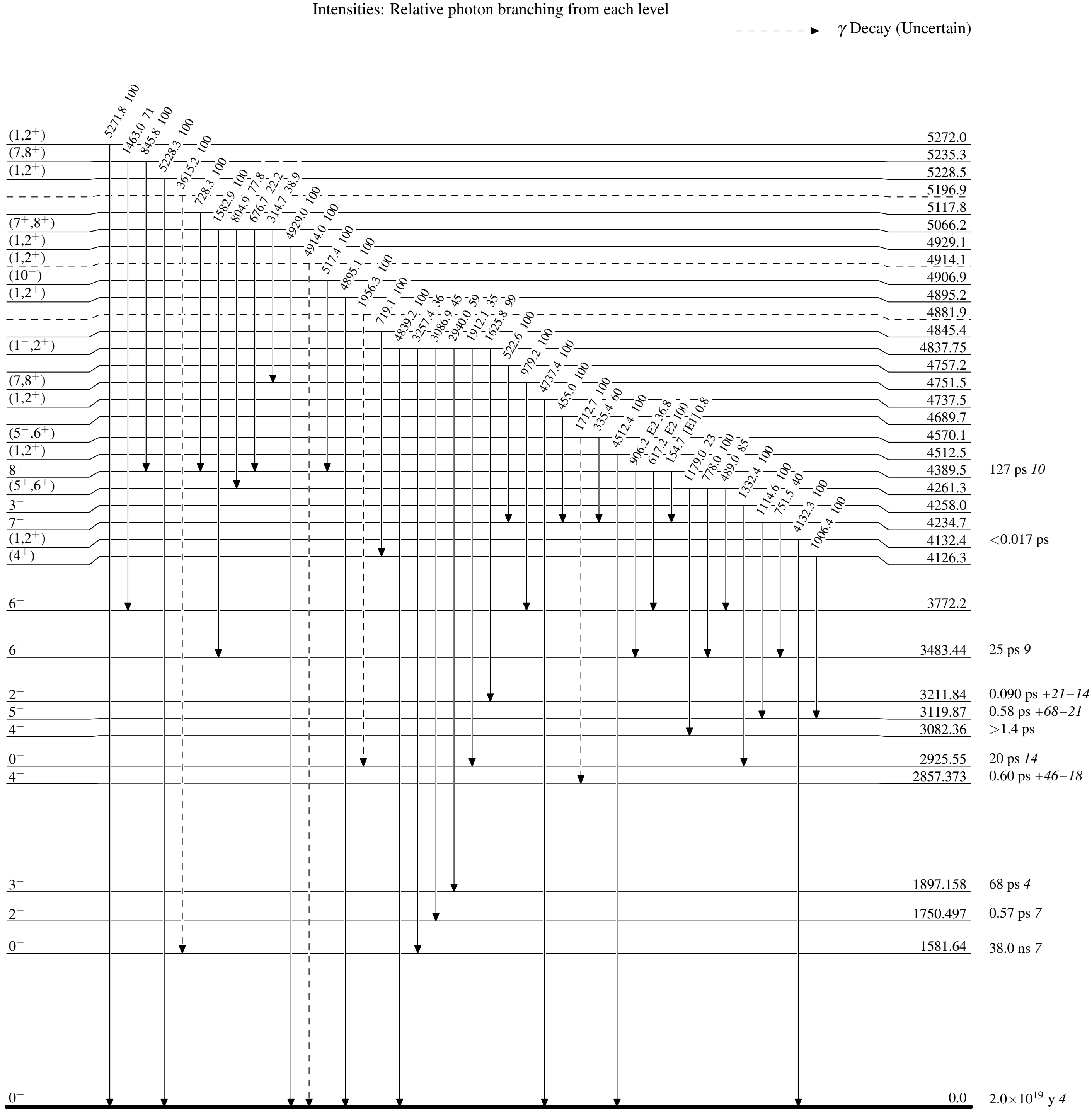
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

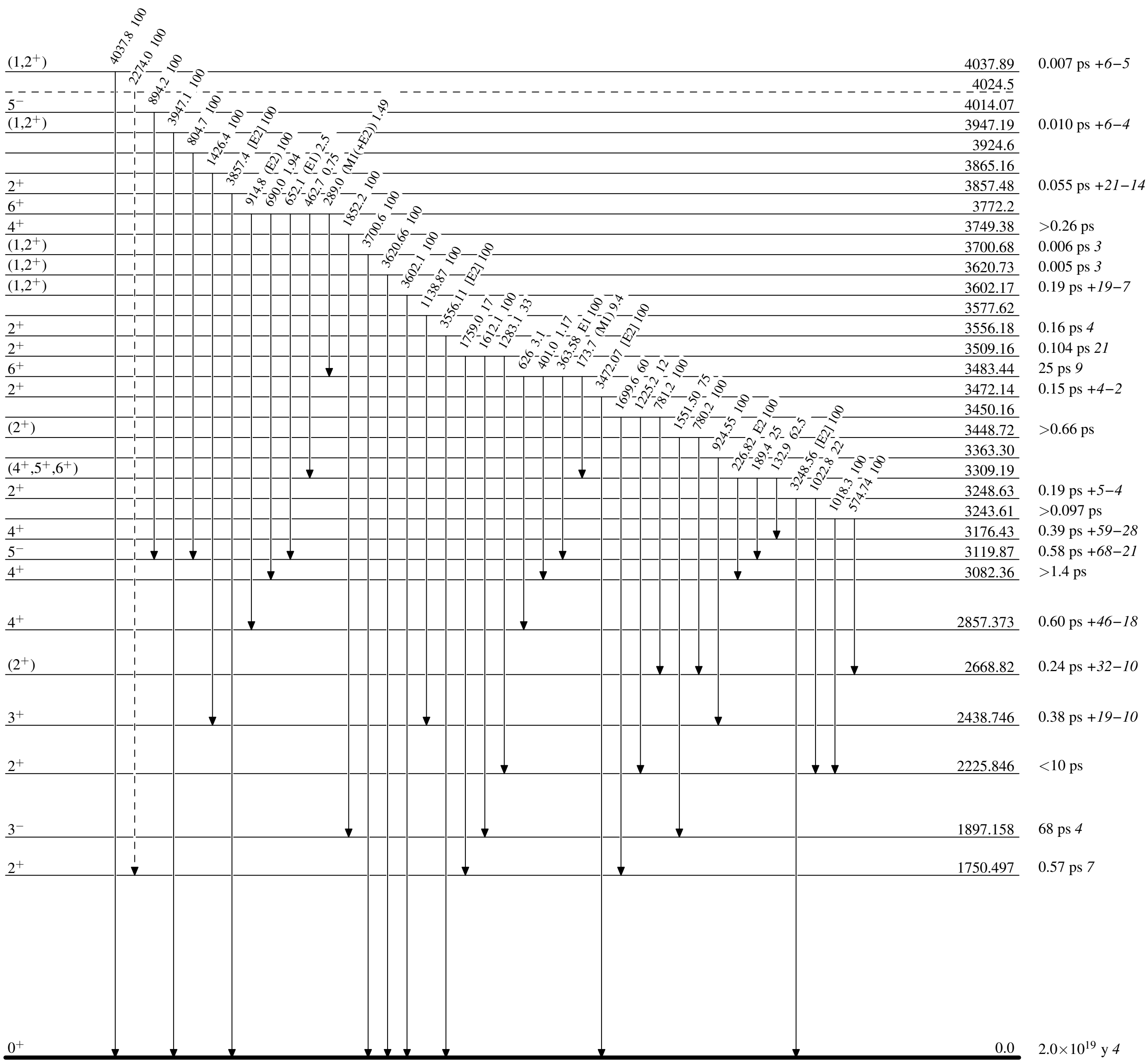
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{96}_{40}Zr_{56}$

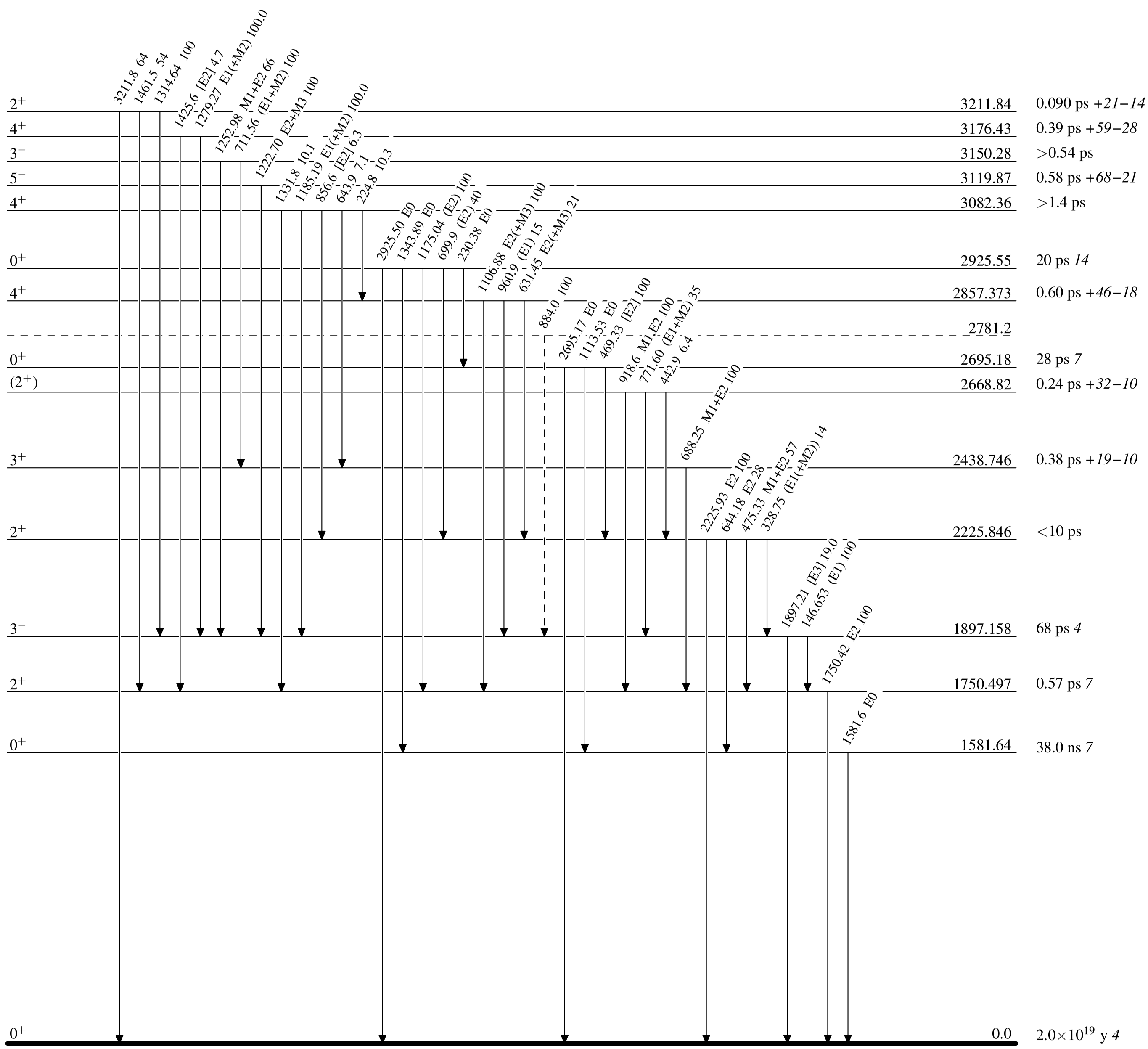
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

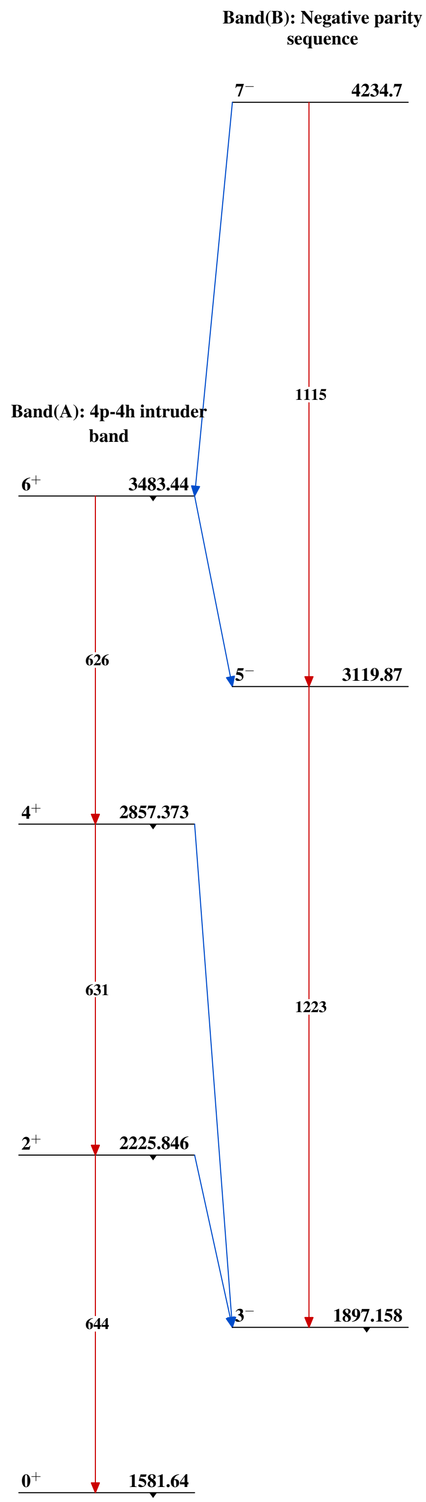
Legend

γ Decay (Uncertain)



$^{96}_{40}Zr_{56}$

Adopted Levels, Gammas



$^{96}_{40}Zr_{56}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

Q(β^-)=2238 *10*; S(n)=6415 *8*; S(p)=12454 *11*; Q(α)=−4866 *9* 2017Wa10
S(2n)=11990 *8*, S(2p)=22940 *12* (2017Wa10).
Mass measurements: 2006Ha03 (also 2006Jo14), 2004Ri12 (also 2005Jo22,2004Jo18).
Additional information 1.
Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for 79 primary references, 75 dealing with nuclear structure calculations and 4 with decay modes and half-lives.

^{98}Zr Levels

Cross Reference (XREF) Flags

A	^{98}Y β^- decay (0.548 s)	E	^{248}Cm SF decay	I	^{100}Mo(^{14}C,^{16}O),(^{6}Li,^{8}B)
B	^{98}Y β^- decay (2.32 s)	F	^{252}Cf SF decay	J	^{235}U(n,Fγ),^{241}Pu(n,Fγ)
C	^{98}Zr IT decay (1.9 μs)	G	^{9}Be(^{238}U,Fγ)	K	^{238}U(α,Fγ)
D	^{99}Y β^-n decay (1.478 s)	H	^{96}Zr(t,p),(t,pγ)	L	Coulomb excitation

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	XREF	Comments
0.0[#]	0$^+$	30.7 s *4*	ABCDEFGHIJKL	%β^-=100 Evaluated rms charge radius=4.401 fm *16* (2013An02). Evaluated δ<r^2>(^{90}Zr,^{98}Zr)=+1.002 fm^2 *5* (2013An02). T$_{1/2}$: from 1976He10. Others: 1968DeZZ, 1967Hu08, 1960Or02. <r^2>$^{1/2}$(^{90}Zr,^{98}Zr)=+0.981 fm^2 *5* (2003Th03,2002Ca37); systematic uncertainty=0.043 fm^2. Also 2005Bi25 from the same group.
854.06[@] *6*	0$^+$	64 ns *7*	ABC EFGHIJKL	J$^\pi$: E0 transition to 0$^+$. T$_{1/2}$: weighted average of 64 ns *7* from ^{98}Y β^- decay (0.548 s) and 65 ns *10* from (n,Fγ).
1222.91[#] *5*	2$^+$	2.63 ps *55*	ABC EFGHIJKL	J$^\pi$: E2 368.8γ to 0$^+$. T$_{1/2}$: from RDDS in ^{9}Be(^{238}U,Fγ) (2018Si26). Others: ≥0.68 ps from B(E2)(W.u.)=8.9 *20* or <11 (2018Wi09) deduced from γ-ray yields in Coulomb excitation; <4 ps from fast-timing $\gamma\gamma$-coin in ^{235}U(n,Fγ), ^{241}Pu(n,Fγ), and analysis by generalized centroid difference method (2017An15); <11 ps (2010Be30), <21 ps (1989Ma38), <0.2 ns (1982Ka03), all from $\beta\gamma$(t) in ^{98}Y decay (0.548 s); <0.20 ns (2001AhZY, $\gamma\gamma$(t) in ^{252}Cf SF decay). μ: >+0.38 *17* (integral PAC method, preliminary result from 2001AhZY).
1436.17[&] *7*	0$^+$	0.72 ns *8*	A EFGH J	J$^\pi$: E0 to 0$^+$. T$_{1/2}$: from $\beta\gamma\gamma$(t) or $\beta\gamma$(t) in ^{98}Y β^- decay (0.548 s). Unweighted average of 0.611 ns *33* (2010Be30), 0.865 ns *42* (1989Ma38), 0.69 ns *10* (1982Ka03). Weighted average is 0.71 ns *9*, but reduced χ^2=11 is too high.
1590.78[@] *6*	2$^+$		AB EFGH JK	J$^\pi$: L(t,p)=2.
1744.61[&] *6*	2$^+$		A EF H J	J$^\pi$: L(t,p)=2.
1806.18[a] *6*	3$^-$		ABC EFGH JK	J$^\pi$: L(t,p)=3.
1843.41[@] *6*	4$^+$	5.2 ps *10*	BC EFGH JK	J$^\pi$: 620.5γ E2 to 2$^+$; 204.3γ from 4$^+$;probable band assignment (1995HaZT). However, $\gamma\gamma(\theta)$ in ^{98}Y β^- decay (2.32 s) suggests J=3. T$_{1/2}$: from RDDS in ^{9}Be(^{238}U,Fγ) (2018Si26). Others: 20 ps *6* from $\beta\gamma$(t) in ^{98}Y β^- decay (2.32 s) (2010Be30); ≤10 ps (2017An15, $\gamma\gamma$(t) fast-timing technique, ≤14 ps in ^{241}Pu(n,Fγ), and ≤10 ps in ^{235}U(n,Fγ)); 28 ps *12* (from ^{98}Y decay (2.32 s), quoted by 1994St31 from thesis by M.

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Adopted Levels, Gammas (continued)

^{98}Zr Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$	XREF	Comments
				Liang, University of Koln (1992)). Note that in 2017An15, lifetime of this state could not be determined precisely due to imprecise lifetime of the first 2^+ state.
1859.37 *7*	0^+	0.290 ns *13*	A H J	J^{π}: 636.5γ E2 to 2^+; E0 to 0^+. $T_{1/2}$: from βγ(t) in ^{98}Y β^- decay (0.548 s). Weighted average of 0.318 ns *27* (2010Be30), 0.283 ns *15* (1989Ma38), and 0.24 ns *10* (1982Ka03).
2047.71[#] *8*	4^+		BC EFGH JK	J^{π}: L(t,p)=4.
2104 *1*			H	J^{π}: 1986Me11 quote 2^+ from decay characteristics; however, no details of γ rays from this level are available.
2225.15 *8*	(2^+)		A	J^{π}: 2225.2γ and 789.0γ to 0^+; no β feeding from 0^- parent.
2276.93[&] *8*	(4^+)		B EFG JK	J^{π}: γγ(θ) in ^{235}U(n,Fγ) (2017Ur03); 686.2γ and 1053.9γ to 2^+; possible band member.
2487 *1*			H	J^{π}: 1986Me11 quote 3^+ from decay characteristics; however, no details of γ transitions from this level are available.
2490.98[@] *6*	6^+	1.80 ps *62*	BC EFGH JK	J^{π}: 647.6γ ΔJ=2, E2 to 4^+; band member. $T_{1/2}$: from RDDS in ^{9}Be(^{238}U,Fγ) (2018Si26). Other: <10 ps from βγ(t) in ^{98}Y β^- decay (2.32 s) (2010Be30).
2568 *1*			H	J^{π}: 1986Me11 quote 4^+ from decay characteristics; however, no details of γ transitions from this level are available.
2613 *1*			H	J^{π}: 1986Me11 quote 2^+ from decay characteristics; however, no details of γ transitions from this level are available.
2778.71 *7*	(2^+)		A	J^{π}: 2779γ to 0^+, 972.2γ to 3^-, no β feeding from 0^- parent.
2800.22[a] *9*	5^-		BC EF H K	J^{π}: L(t,p)=5.
3035 *8*			H	
3064.37[b] *13*	$5^{(-)}$		BC EFGh J	J^{π}: ΔJ=2, Q 1258.2γ to 3^-, 1221.0γ and 1016.7γ to 4^+.
3065.61 *15*	(1)		A h	J^{π}: 3065.5γ to 0^+; possible β feeding from 0^- parent.
3117.10[&] *11*	(6^+)		B EFG K	J^{π}: 1273.7γ ΔJ=2, Q to 4^+; member of a sequence.
3160 *8*			H	
3216.35[@] *12*	8^+	1.95 ps *47*	BC EFGH JK	XREF: H(3205). J^{π}: 725.4γ ΔJ=2, E2 to 6^+; spin=8 from γγ(θ) in ^{252}Cf SF decay; band member. $T_{1/2}$: from DSAM in ^{248}Cm SF decay (2012Sm02).
3249.02 *22*	$(5,6,7^-)$		B E	J^{π}: 448.8γ to 5^-; possible β feeding from $(7^+,6^+)$ parent.
3271 *8*	4^+		H	J^{π}: L(t,p)=4.
3336.4 *5*			EF	
3354 *8*	5^-		H	J^{π}: L(t,p)=5.
3435 *8*	2^+		H	J^{π}: L(t,p)=2.
3506 *8*			H	
3539 *8*			H	
3576.26[b] *12*	(7^-)		C EF	J^{π}: 776γ to $5^{(-)}$; member of a sequence built on $5^{(-)}$.
3592.2[a] *5*	(7^-)		EF	J^{π}: 792γ to 5^-; member of a sequence.
3739 *8*			H	
3763 *8*			H	
3812.1[&] *4*	(8^+)		EFG K	J^{π}: 1321.6γ to 6^+; member of a sequence.
3825 *8*			H	
3855 *8*			H	
3894.1 *4*	(7^-)		EFGH K	XREF: H(3886). J^{π}: L(t,p)=(7).
3984.73[@] *14*	(10^+)	1.42 ps *34*	C EFG JK	J^{π}: 768.4γ to 8^+; possible band member. $T_{1/2}$: from DSAM in ^{248}Cm SF decay (2012Sm02).
4005 *8*	$(5^-,6^+)$		H	J^{π}: L(t,p)=(5,6).
4061 *8*	(6^+)		H	J^{π}: L(t,p)=(6).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{98}Zr Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$	XREF	Comments
4097 *8*	(5^-,6^+)		H	J^{π}: L(t,p)=(5,6).
4108.67 *13*	(1)		A	J^{π}: 2672.7γ, 3254.4γ and 4108.5γ to 0^+; possible β feeding from 0^- parent.
4165.18 *6*	1^-		A F J	J^{π}: log *ft*=4.3 (allowed transition) from 0^-; 2728.9γ to 0^+; spin=1 from $\gamma\gamma(\theta)$ in ^{252}Cf SF decay.
4198.88[b] *14*	(9^-)		C EF	J^{π}: 622.6γ to (7^-); member of a sequence built on $5^{(-)}$.
4225 *8*	6^+		H	J^{π}: L(t,p)=6.
4271.11 *6*	1^-		A J	J^{π}: log *ft*=5.2 (allowed transition) from 0^-; 2411.9γ to 0^+; also supported by $\gamma\gamma(\theta)$ in (n,Fγ).
4278.79 *12*			B	J^{π}: (5,6,7,8^+) from 1787.8γ to 6^+; log *ft*=6.0 from (7^+,6^+).
4292.41 *10*	6^+		B EF J	J^{π}: log *ft*=4.9 from (7^+,6^+); spin=6 from $\gamma\gamma(\theta)$ in (n,Fγ) and ^{98}Y β^- decay (2.32 s).
4365 *8*			H	
4387 *8*			H	
4399.07 *12*	1^-		A	J^{π}: log *ft*=5.3 (allowed transition) from 0^-; 2174.4γ to 0^+.
4450 *8*	(7^-)		H	J^{π}: L(t,p)=(7).
4452.59 *9*	1^-		A J	J^{π}: log *ft*=4.5 from 0^-; 2593γ to 0^+; spin=1 from $\gamma\gamma(\theta)$ in (n,Fγ).
4492.35 *15*	1^-		A	J^{π}: log *ft*=5.3 from 0^-; 4492γ, 3638.6γ to 0^+.
4545.81 *14*	(7^+)		B EF	J^{π}: 253.4γ to 6^+; possible (weak) β feeding (log *ft*=6.3) from (7^+,6^+) parent.
4608 *8*			H	
4754.71[@] *16*	(12^+)		C EF K	J^{π}: 770γ to (10^+); band member.
4916.61[b] *16*	(11^-)		C F	J^{π}: 717.7γ to (9^-), member of a sequence.
5589.29[@] *17*	(14^+)		C F K	J^{π}: 834.6γ to (12^+); band member.
5720.94[b] *17*	(13^-)		C F	J^{π}: 804.3γ to (11^-); member of a sequence.
6538.9[@] *11*	(16^+)		K	E(level): see comment for 6541 level for the two levels being separate. J^{π}: γ to (14^+), band member.
6541.37[b] *17*	(15^-)		C F	E(level): 2006Si36 suggest that 6541 level is most likely different from a (16^+) level at 6539 decaying by a 949.6γ proposed by 2004Wu08, as no 820γ was reported in 2004Wu08. J^{π}: γs to (14^+) and (13^-); member of a sequence.
6601.9 *11*	(17^-)	1.9 μs *2*	C	%IT=100 J^{π}: proposed configuration=$\pi g^2_{9/2}\otimes\nu(g_{7/2}h_{11/2})$. $T_{1/2}$: from sum of time spectra gated on 952γ+835γ+820γ+804γ+770γ+768γ+725γ+718γ (2006Si36). Other: 1.4 μs *5* (2013RuZX, from 1223γ(t)).
7595.9[@] *15*	(18^+)		K	J^{π}: 1057γ to (16^+); band member.
8725.4[@] *18*	(20^+)		K	J^{π}: 1229.5γ to (18^+); band member.

[†] From least-squares fit to Eγ data, assuming 0.5 keV uncertainty when not stated.

[‡] Ascending spins are assumed for levels populated in SF decays due to yrast pattern of excitation of levels in such studies.

[#] Seq.(B): γ cascade based on g.s.

[@] Band(A): Band based on 854, 0^+. The 2^+ member of this band is either at 1590.8 keV as in 2001Ur01 or at 1222.9 keV as in 2006Si36. Q(intrinsic)=2.00 *10* (2001Ur01) from lifetime data for 12^+, 10^+ and 8^+ states.

[&] Seq.(C): γ cascade based on 1436, 0^+.

[a] Seq.(D): γ cascade based on 3^-. Possible octupole structure.

[b] Seq.(E): γ cascade based on (5^-), 3064.

$\gamma(^{98}Zr)$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ	α[#]	$I_{(\gamma+ce)}$	Comments
854.06	0^+	854.06 *6*		0.0	0^+	E0			100	Monopole strength ρ^2(E0)=0.0112 *12* (2005Ki02 evaluation), based on data in 1994Lh01. Energy of E0 transition from level energy difference. Mult.: from ce data in (t,pγ) and ^{98}Y β^- decay (0.548 s).
1222.91	2^+	368.8 *1*	2.5 *2*	854.06	0^+	[E2]		0.0109		B(E2)(W.u.)=29 *+8−6* E_γ: other: 370.0 *10* in (α,Fγ). I_γ: from ^{98}Y β^- decay (0.548 s). Others: 2.1 *2* in (α,Fγ), 0.9 *3* in ^{248}Cm SF decay.
		1222.9 *1*	100.0 *2*	0.0	0^+	E2		0.00044		B(E2)(W.u.)=2.9 *+8−5* E_γ: others: 1222.7 *2* in ^{98}Zr IT decay, 1222.7 *10* in (α,Fγ). I_γ: deduced from ^{98}Y β^- decay (0.548 s). Uncertainty of 0.2 is from deduced absolute γ-branching ratios to the 854 level and the ground state. Mult.: $\gamma\gamma(\theta)$ in β^- decay (0.548 s) and ^{235}U(n,Fγ), and RUL.
1436.17	0^+	213.2 *1*	100 *4*	1222.91	2^+	E2		0.0716		B(E2)(W.u.)=58 *8* Mult.: $\gamma\gamma(\theta)$ in β^- decay (0.548 s) and ^{235}U(n,Fγ), and RUL.
		582.0[‡] *2*		854.06	0^+	E0[‡]			6.6 *6*	Mult.: ce data in (t,pγ) and ^{98}Y β^- decay (0.548 s). Evaluated q_K^2(E0/E2)=1.05 *7*, X(E0/E2)=0.054 *3*, ρ^2=0.076 *6* (2005Ki02), based on data in 1994Lh01 and 1982Ka03. Monopole strength ρ=0.274 *15* (1994Lh01), 0.29 *8* (1982Ka03). I(E0)/I(E2)=0.065 *4* (1994Lh01).
1590.78	2^+	154.5	1.9	1436.17	0^+	[E2]		0.228		
		367.8 *1*	11.7 *8*	1222.91	2^+	[M1+E2]		0.0088 *22*		
		736.8 *1*	14.6 *8*	854.06	0^+	[E2]				
		1590.9 *1*	100 *3*	0.0	0^+	E2				Mult.: from $\gamma\gamma(\theta)$ in ^{98}Zr β^- decay (0.548 s), and (n,Fγ), and ΔJ^π, where J^π of each level is known independently.
1744.61	2^+	152.7[@]	3	1590.78	2^+	[M1+E2]		0.15 *9*		
		521.6 *1*	79 *3*	1222.91	2^+	M1+E2	+0.44 *4*	0.00302		Mult.,δ: $\gamma\gamma(\theta)$ in ^{235}U(n,Fγ), D+Q from $\gamma\gamma(\theta)$, M1+E2 from ΔJ^π, where each J^π is determined uniquely in different experiments. Other δ: +0.2 *1* from $\gamma\gamma(\theta)$ in ^{98}Y β^- decay (0.548 s).
		890.6 *1*	43 *3*	854.06	0^+					
		1744.5 *1*	100 *4*	0.0	0^+					
1806.18	3^-	215.5 *2*	6.7 *17*	1590.78	2^+	[E1]		0.0122		
		583.258 *30*	100 *3*	1222.91	2^+	E1				Mult.: $\gamma(\theta)$ and γ(pol) in ^{248}Cm SF decay.
1843.41	4^+	252.7 *2*	1.7 *4*	1590.78	2^+	[E2]		0.0392		B(E2)(W.u.)=54 *+18−16*

$^{98}_{40}Zr_{58}$-4

$\gamma(^{98}Zr)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.	α#	$I_{(\gamma+ce)}$	Comments
									I_γ: others: 1.4 *2* in (α,Fγ), 5.2 *17* in ^{248}Cm SF decay, 4.8 in ^{252}Cf SF decay. Values in SF decay seem too high by a factor of ≈3.
1843.41	4^+	620.505 *19*	100 *3*	1222.91	2^+	E2	0.00225		B(E2)(W.u.)=42 *+10−7*
									I_γ: other: 100 in (α,Fγ), 100 *5* in ^{248}Cm SF decay.
									Mult.: $\gamma(\theta)$ and γ(pol) in ^{248}Cm SF decay.
1859.37	0^+	268.7 *1*	100 *3*	1590.78	2^+	E2	0.0316		B(E2)(W.u.)=42 *3*
									Mult.: $\gamma\gamma(\theta)$ and RUL.
		423.0‡ *2*		1436.17	0^+	E0‡		1.5 *2*	Mult.: ce data in (t,pγ) and ^{98}Y β^- decay (0.548 s).
									Evaluated q^2_K(E0/E2)=5.4 *14*, X(E0/E2)=26 *7*, ρ^2=0.061 *8* (2005Ki02), based on data in 1994Lh01 and 1982Ka03.
									Monopole strength ρ=0.237 *25* (1994Lh01), 0.29 *15* (1982Ka03).
									I(E0)/I(E2(269γ))=0.0130 *16* (1994Lh01).
		636.5 *1*	18.1 *9*	1222.91	2^+	E2	0.00209		B(E2)(W.u.)=0.103 *8*
									Mult.: Q from $\gamma\gamma(\theta)$ in ^{98}Y β^- decay (0.548 s); M2 ruled out by RUL.
2047.71	4^+	204.3 *1*	14 *3*	1843.41	4^+	[M1+E2]	0.06 *3*		I_γ: other: 21 *7* in ^{248}Cm SF decay. Iγ=67 in ^{252}Cf SF decay is discrepant.
		241.5 *1*	100 *8*	1806.18	3^-	[E1]	0.00885		E_γ: other: 240.1 *1* from ^{98}Zr IT decay.
									I_γ: others: 100 *14* in ^{248}Cm SF decay, 100 in ^{252}Cf SF decay.
		456.8 *2*	11 *3*	1590.78	2^+	[E2]			I_γ: other: 21 *7* in ^{248}Cm SF decay. Iγ=67 in ^{252}CF SF decay is discrepant.
		824.8 *2*	28 *3*	1222.91	2^+	E2			I_γ: other: 36 *7* in ^{248}Cm SF decay. Iγ=133 in ^{252}Cf SF decay is discrepant.
									Mult.: $\gamma(\theta)$ in ^{248}Cm SF decay, and ΔJ^π.
2225.15	(2^+)	789.0 *2*	45 *9*	1436.17	0^+				
		1002.3 *1*	100 *18*	1222.91	2^+				
		2225.2 *2*	45 *18*	0.0	0^+				
2276.93	(4^+)	433.5 *1*	36 *7*	1843.41	4^+				I_γ: from ^{98}Y β^- decay (2.32 s).
		686.2 *1*	100 *7*	1590.78	2^+				I_γ: 24 in ^{252}Cf SF decay is discrepant.
		1053.9 *1*	100 *7*	1222.91	2^+				I_γ: from ^{98}Y β^- decay (2.32 s), 414 from ^{252}Cf SF decay.
2490.98	6^+	647.580 *30*	100	1843.41	4^+	E2	0.0020		B(E2)(W.u.)=106 *+56−27*
									Mult.: $\gamma(\theta)$ and γ(pol) in ^{248}Cm SF decay, also supported by $\gamma\gamma(\theta)$ in ^{98}Y β^- decay (2.32 s).
2778.71	(2^+)	972.2 *2*	25 *4*	1806.18	3^-				
		1033.9 *3*	18 *4*	1744.61	2^+				
		1187.8 *2*	14 *4*	1590.78	2^+				
		1555.7 *1*	100 *11*	1222.91	2^+				
		2779.0 *2*	14 *4*	0.0	0^+				
2800.22	5^-	752.5 *1*	100 *8*	2047.71	4^+				I_γ: others: 100 *19* in ^{98}Zr IT decay, 100 *17* in ^{248}Cm SF decay, 100 in ^{252}Cf SF decay.
		956.6 *2*	13 *4*	1843.41	4^+				I_γ: others: 50 *17* in ^{248}Cm SF decay, 12.5 in ^{252}Cf SF decay.
		994.0 *1*	38 *8*	1806.18	3^-				I_γ: others: 50 *19* in ^{98}Zr IT decay, 50 *17* in ^{248}Cm SF decay, 63 in ^{252}Cf SF decay.

$^{98}_{40}Zr_{58}$-5

$\gamma(^{98}Zr)$ (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.	α#	Comments
3064.37	$5^{(-)}$	1016.7	50 *25*	2047.71	4^+			E_γ,I_γ: from ^{248}Cm SF.
		1221.0 *5*	75 *25*	1843.41	4^+			$E\gamma$ from IT decay. $I\gamma$ from ^{248}Cm SF.
		1258.6 *4*	100 *25*	1806.18	3^-	Q		E_γ: unweighted average of 1258.9 *1* from ^{98}Y β^- decay (2.32 s) and 1258.2 *2* from ^{98}Zr IT decay (1.9 μs). I_γ: from ^{248}Cm SF. Mult.: $\gamma\gamma(\theta)$ in IT decay.
3065.61	(1)	3065.5 *2*	100	0.0	0^+			
3117.10	(6^+)	840.1 *1*	100 *11*	2276.93	(4^+)			
		1273.7 *2*	28 *11*	1843.41	4^+	Q		Mult.: γ(DCO) in ^{248}Cm SF decay.
3216.35	8^+	725.4 *1*	100	2490.98	6^+	E2	0.00148	B(E2)(W.u.)=54 *13* E_γ: from IT decay. Other: 725.3 *2* in ^{98}Y β^- decay (2.32 s). Mult.: $\gamma\gamma(\theta)$ and γ(pol) in ^{248}Cm SF decay ,also supported by $\gamma\gamma(\theta)$ in ^{252}Cf SF decay and RUL.
3249.02	$(5,6,7^-)$	448.8 *2*	100	2800.22	5^-			
3336.4		846@	20×10^1 *10*	2490.98	6^+			E_γ,I_γ: from ^{248}Cm SF.
		1493.0	100 *50*	1843.41	4^+			E_γ,I_γ: from ^{248}Cm SF.
3576.26	(7^-)	511.9 *1*	70 *25*	3064.37	$5^{(-)}$			E_γ: from IT decay. I_γ: unweighted average of 111 *25* in IT decay, 50 *25* in ^{248}Cm SF decay and 47 in ^{252}Cf SF decay.
		776.0 *1*	100 *21*	2800.22	5^-			E_γ,I_γ: from IT decay. Others: $I\gamma$=100 *50* in ^{248}Cm SF and 100 in ^{252}Cf SF.
3592.2	(7^-)	792.0	100	2800.22	5^-			
3812.1	(8^+)	694.6 *10*	25	3117.10	(6^+)			E_γ: from (α,Fγ). Others: 694.3 from ^{248}Cm SF, 694.8 from ^{252}Cf SF. I_γ: from ^{252}Cf SF.
		1321.6	100	2490.98	6^+			E_γ: average of 1321.0 from ^{248}Cm SF and 1322.2 from ^{252}Cf SF.
3894.1	(7^-)	677.7 *3*	100	3216.35	8^+			
3984.73	(10^+)	768.4 *1*	100	3216.35	8^+	[E2]	0.00127	B(E2)(W.u.)=55 *14* E_γ: from IT decay. Other: 770.0 *10* from (α,Fγ).
4108.67	(1)	2672.7 *2*	60 *10*	1436.17	0^+			
		3254.4 *2*	100 *20*	854.06	0^+			
		4108.5 *2*	40 *10*	0.0	0^+			
4165.18	1^-	1099.5 *2*	2.8 *4*	3065.61	(1)			
		1386.3 *1*	11.1 *7*	2778.71	(2^+)			
		2305.9 *1*	16.7 *7*	1859.37	0^+			
		2420.6 *1*	26.4 *7*	1744.61	2^+			
		2574.4 *1*	22.9 *7*	1590.78	2^+	(E1)		Mult.: $\gamma\gamma(\theta)$ in ^{235}U(n,Fγ).
		2728.9 *1*	7.6 *4*	1436.17	0^+			
		2942.3 *1*	100 *3*	1222.91	2^+	(E1)		Mult.: $\gamma\gamma(\theta)$ in ^{98}Y β^- (0.548 s), ^{252}Cf SF, and ^{235}U(n,Fγ).
		3311.1 *1*	52.4 *17*	854.06	0^+			
		4164.9 *2*	3.8 *4*	0.0	0^+			
4198.88	(9^-)	622.6 *1*	100	3576.26	(7^-)			E_γ: from IT decay.
4271.11	1^-	1492.4 *1*	94 *6*	2778.71	(2^+)			
		2045.9 *2*	19 *6*	2225.15	(2^+)			

Adopted Levels, Gammas (continued)

$\gamma(^{98}Zr)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.	δ	α#	Comments
4271.11	1^-	2411.9 *2*	25 *6*	1859.37	0^+				
		2526.3 *1*	69 *6*	1744.61	2^+				
		2680.3 *1*	100 *6*	1590.78	2^+	(E1)			Mult.: $\gamma\gamma(\theta)$ in ^{235}U(n,Fγ).
		2834.4 *3*	25 *6*	1436.17	0^+				
		3048.3 *1*	56 *6*	1222.91	2^+				
		3416.9 *1*	63 *6*	854.06	0^+				
		4271.3 *2*	31 *6*	0.0	0^+				
4278.79		1787.8 *1*	100	2490.98	6^+				
4292.41	6^+	698.6@	4.4	3592.2	(7^-)				E_γ: from ^{252}Cf SF decay only.
		1174.9 *3*	9.2 *15*	3117.10	(6^+)				
		1492.0 *2*	11.5 *15*	2800.22	5^-				
		1801.6 *1*	100 *3*	2490.98	6^+	M1+E2	+0.17 *8*		Mult.: $\gamma\gamma(\theta)$ in ^{98}Y β^- (2.32 s), ^{252}Cf SF, and ^{235}U(n,Fγ). δ: from $\gamma\gamma(\theta)$ in ^{98}Y β^- (2.32 s). Other: −0.77 *12* from $\gamma\gamma(\theta)$ in (n,Fγ).
		2015.4 *2*	5.4 *8*	2276.93	(4^+)				
		2244.0 *4*	1.5 *8*	2047.71	4^+				
		2448.8 *2*	3.1 *8*	1843.41	4^+				
4399.07	1^-	2174.4 *2*	54 *18*	2225.15	(2^+)				
		2539.5 *2*	25 *4*	1859.37	0^+				
		2962.1 *5*	7 *4*	1436.17	0^+				
		3176.0 *3*	11 *4*	1222.91	2^+				
		4398.8 *2*	100 *4*	0.0	0^+				
4452.59	1^-	2227.3 *2*	5.9 *12*	2225.15	(2^+)				
		2593.0 *3*	2.9 *6*	1859.37	0^+				
		2707.8 *3*	3.5 *12*	1744.61	2^+				
		2861.7 *3*	2.9 *6*	1590.78	2^+				
		3016.6 *2*	4.7 *6*	1436.17	0^+				
		3229.8 *2*	35.9 *12*	1222.91	2^+	E1			Mult.: $\gamma\gamma(\theta)$ in ^{235}U(n,Fγ).
		3598.4 *2*	4.7 *6*	854.06	0^+				
		4452.4 *2*	100 *4*	0.0	0^+				
4492.35	1^-	3056.3 *3*	11 *3*	1436.17	0^+				
		3638.6 *3*	11 *2*	854.06	0^+				
		4492.0 *2*	100 *3*	0.0	0^+				
4545.81	(7^+)	253.4 *1*	100	4292.41	6^+	[M1+E2]		0.028 *11*	
4754.71	(12^+)	770.0 *1*	100	3984.73	(10^+)				E_γ: from IT decay.
4916.61	(11^-)	717.7 *1*	100	4198.88	(9^-)				E_γ: from IT decay.
5589.29	(14^+)	834.6 *1*	100	4754.71	(12^+)				E_γ: from IT decay.
5720.94	(13^-)	804.3 *1*	100	4916.61	(11^-)				E_γ: from IT decay.
6538.9	(16^+)	949.6 *10*		5589.29	(14^+)				E_γ: from (α,Fγ).
6541.37	(15^-)	820.4 *1*	100 *19*	5720.94	(13^-)				E_γ,I_γ: from IT decay.
		952.1 *1*	59 *12*	5589.29	(14^+)				E_γ,I_γ: from IT decay.
6601.9	(17^-)	63.0 *1*	100	6541.37	(15^-)	(E2)		5.91 *9*	α(K)=4.52 *7*; α(L)=1.157 *19*; α(M)=0.204 *4*; α(N)=0.0260 *4*; α(O)=0.000682 *11*

98/40Zr58-7

$\gamma(^{98}Zr)$ (continued)

E_i(level)	J^π_i	E_γ†	E_f	J^π_f	Comments
					α(exp)=5.5 *16* (2006Si36) B(E2)(W.u.)=1.62 *18* E_γ: from IT decay. Mult.: from α(expt)=5.5 *16* (2006Si36), deduced from intensity balance. Value is consistent with E2(+M1), δ>1.25 or E2(+M3), δ<0.09. E_γ: 2006Si36 discussed another scenario for the placement of 63.0γ: two closely-spaced 63.0-keV gamma rays, an E1 to 6540, (16^+) level (from 2004Wu08) and E2 to 6541, (15^-) level, however, based on intensity-balance arguments, this scenario was considered unlikely.
7595.9	(18^+)	1057.0 *10*	6538.9	(16^+)	E_γ: from (α,Fγ).
8725.4	(20^+)	1129.5 *10*	7595.9	(18^+)	E_γ: from (α,Fγ).

† Most γ-ray data for low-spin (J≤2) levels are from ^{98}Y β^- decay (0.548 s), and for high-spin (J>2) are from ^{98}Y β^- decay (2.32 s), based on detailed studies by 2017Ur03, when a level is populated in these decays. Exceptions are noted.

‡ E0 transitions are from ce data in (t,pγ) (1986Me11) and from ^{98}Y β^- decay (0.548 s) (1994Lh01,1982Ka03).

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.

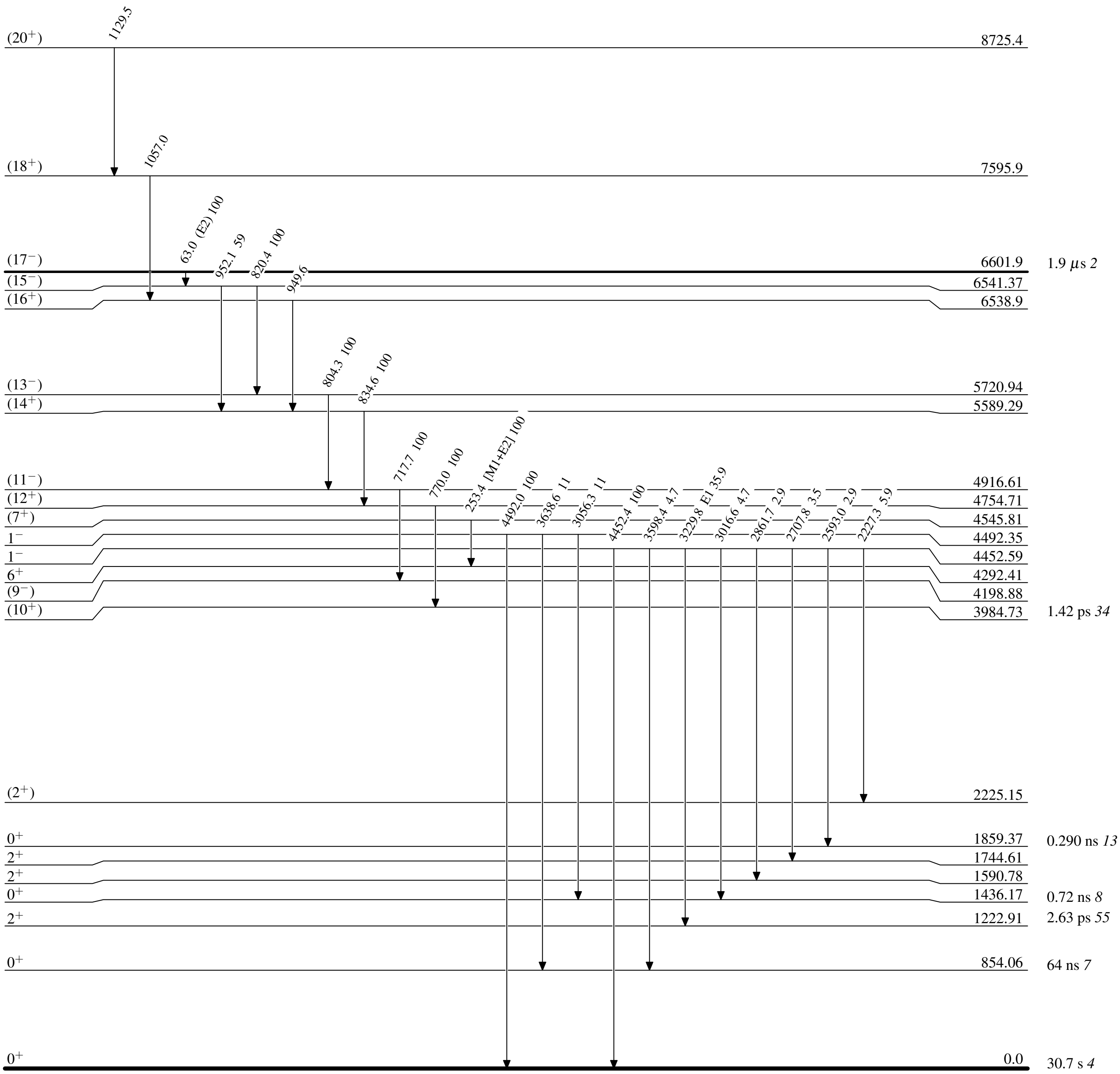
@ Placement of transition in the level scheme is uncertain.

$^{98}_{40}Zr_{58}$-8

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

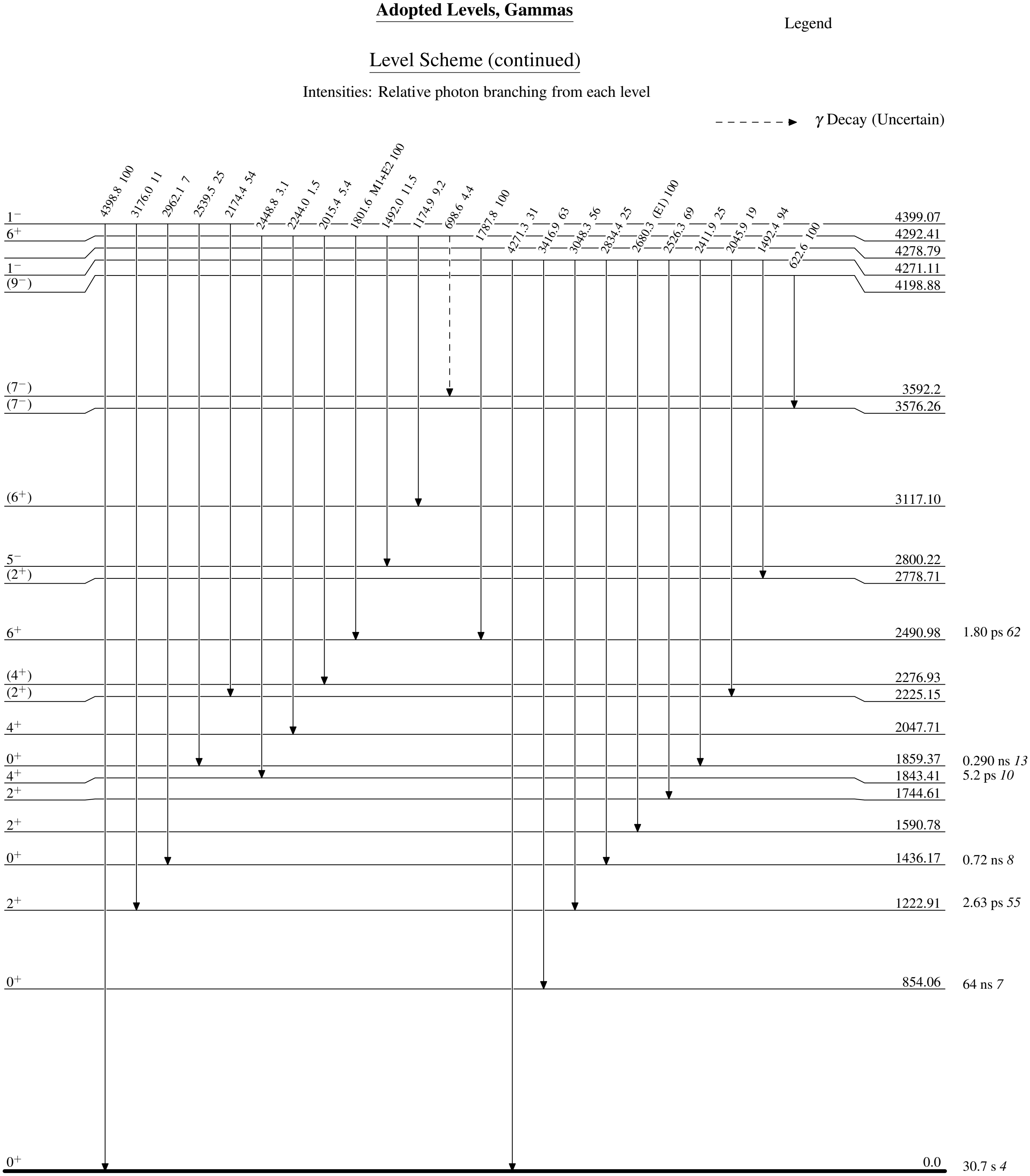


$^{98}_{40}Zr_{58}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{98}_{40}Zr_{58}$

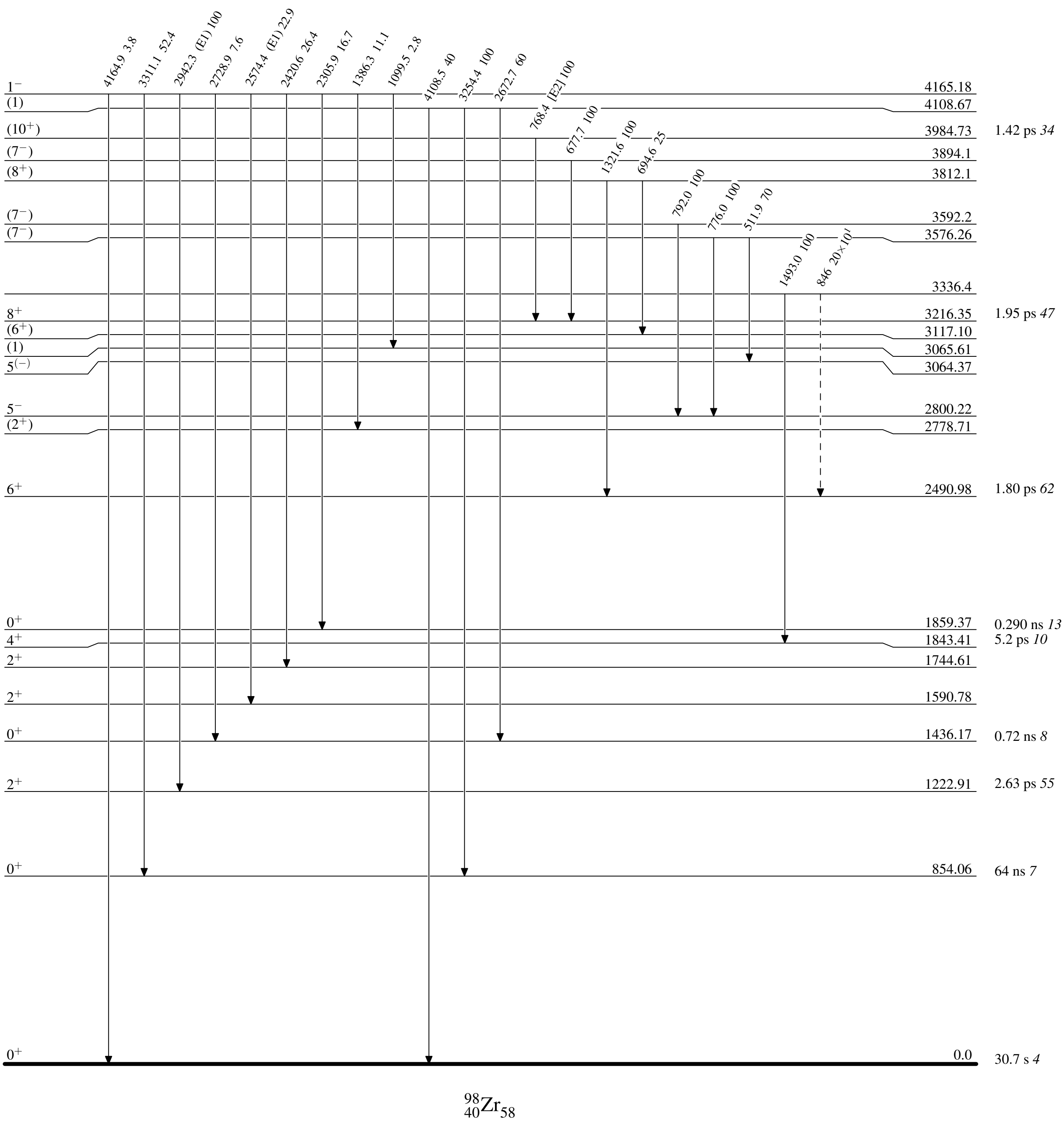
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

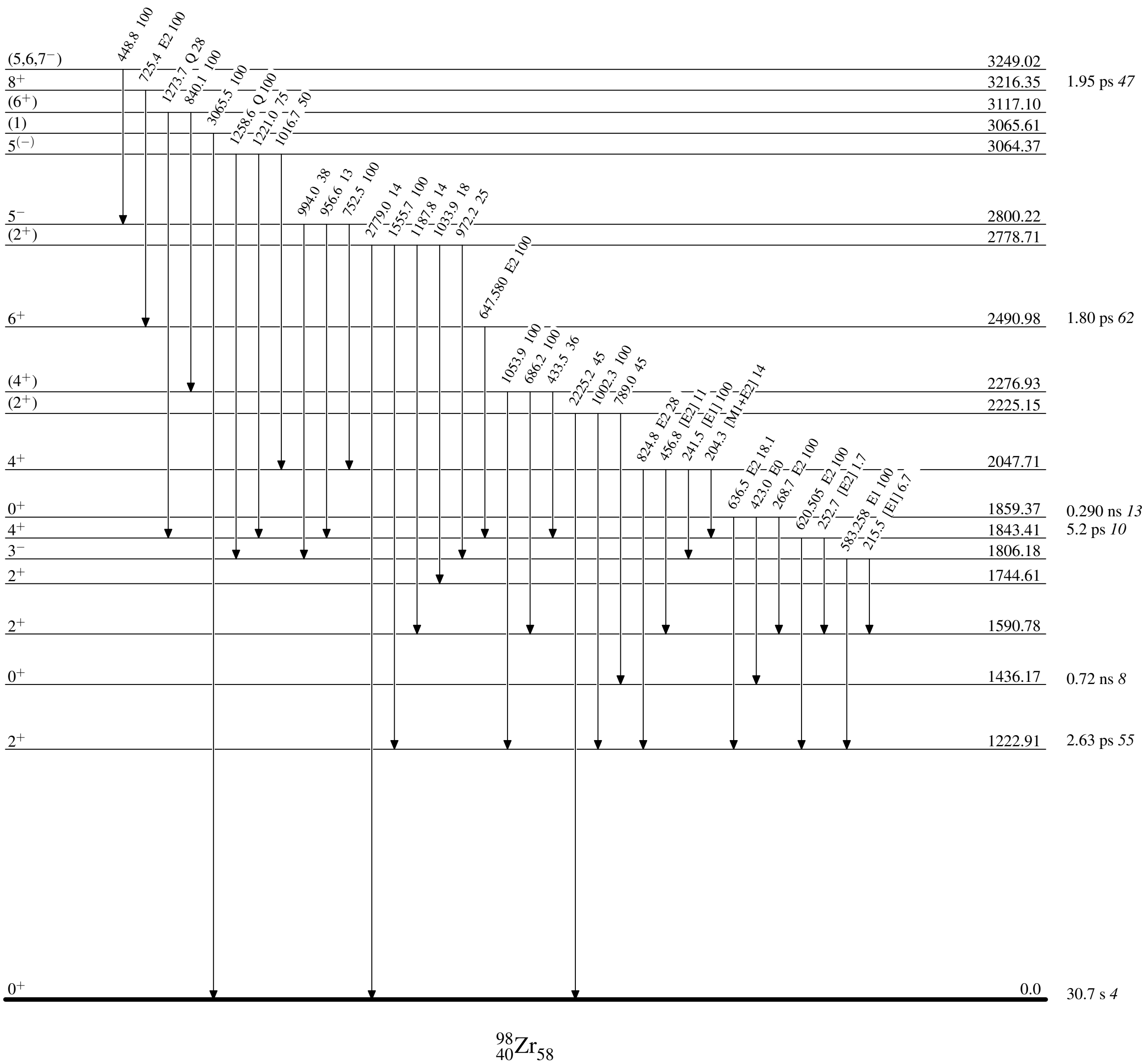


$^{98}_{40}Zr_{58}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

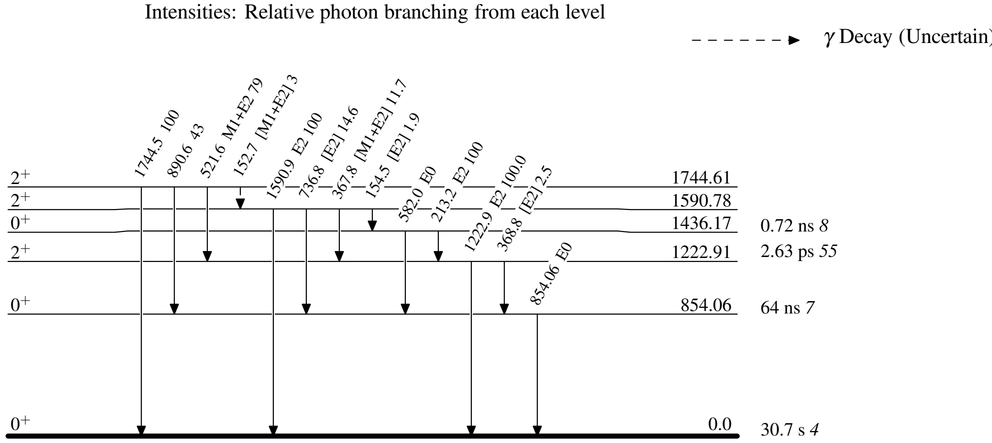


Adopted Levels, Gammas

Legend

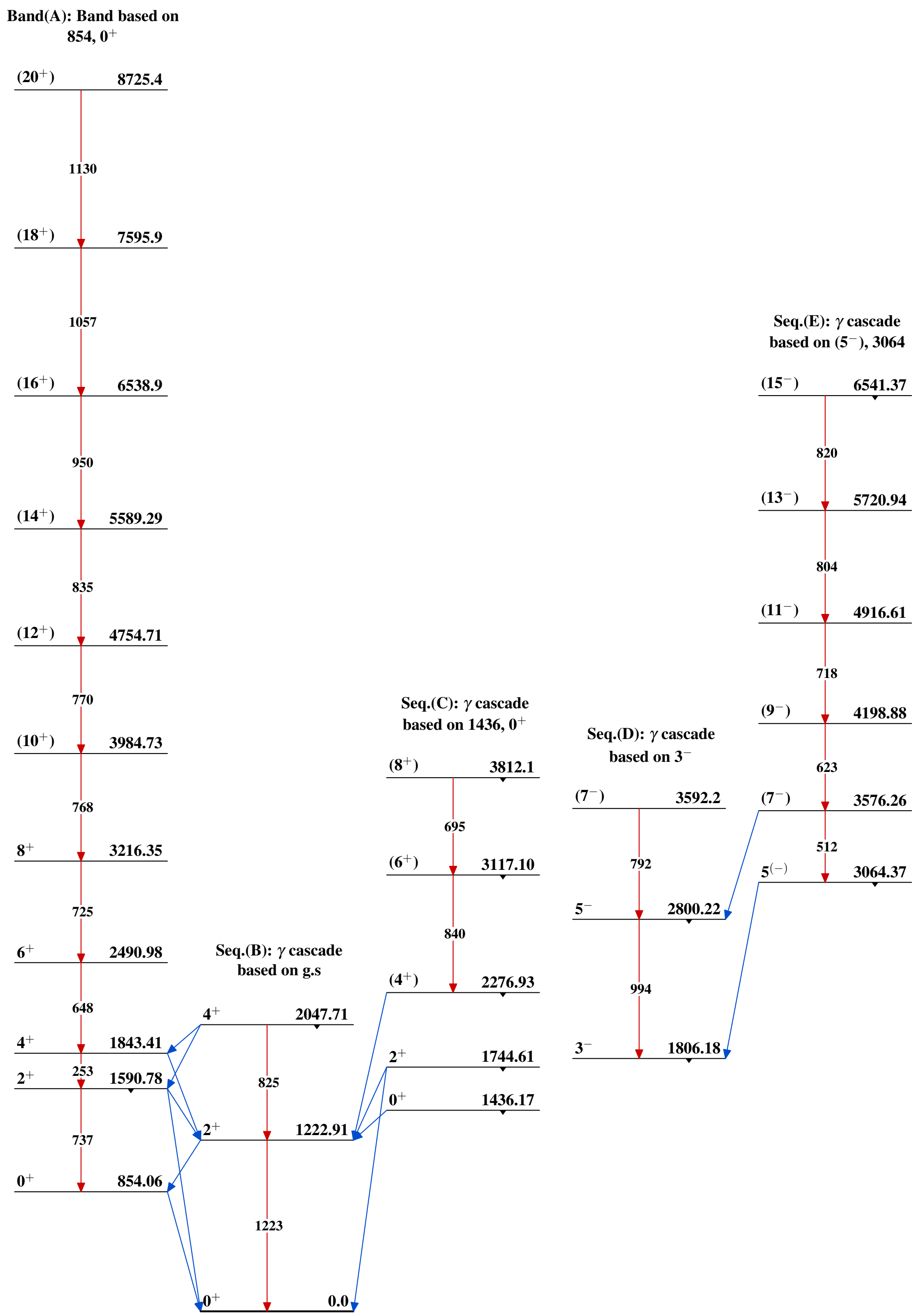
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{98}_{40}Zr_{58}$

Adopted Levels, Gammas



$^{98}_{40}Zr_{58}$