^{96}Y β^- decay (9.6 s) 1987StZX

History

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

Parent: ^{96}Y: E=1140 *30*; $J^\pi=(8^+)$; $T_{1/2}$=9.6 s *2*; Q(β^-)=7096 *23*; %β^- decay=100.0

1995HaZT,1997RaZZ: SF of ^{252}Cf; measured Eγ, Iγ, $\gamma\gamma\gamma$ coin data at the γ-sphere; experimental details not available.

1991OhZZ,1990OhZZ,1990Oh02: measured $T_{1/2\ 1/2}$ by $\beta\gamma\gamma$ coin.

1987StZX,1987St12,1988StZS: measured Eγ, Iγ, $\gamma\gamma$ coin, $\gamma\gamma(\theta)$.

1975Sa15: studied both g.s. and isomeric decay of ^{96}Y; measured Eγ, Iγ, $\gamma\gamma$ coin, Eβ, $T_{1/2\ 1/2}$.

1975Kl11: identification of ^{96}Y decay with $T_{1/2\ 1/2}$=9.6 s *3* from chemical separation of fission products; measured Eγ, Iγ, $\gamma\gamma$ coin.

Decay scheme is from 1987StZX. This decay scheme and that of 1995HaZT, 1997RaZZ are very similar, except for the differences pointed out in comments.

^{96}Zr Levels

E(level)[†]	J^π[#]	$T_{1/2}$	Comments
0.0	0^+		
1582.5 *1*	0^+		
1750.6 *2*	2^+		J=2 from ΔJ=2 transition to 0^+.
1897.6 *2*	3^-	46 ps *15*	J=3 from ΔJ=1 transition to 2^+. $T_{1/2}$: from 1990Oh02, 1990OhZZ. Other: 84 ps *44* (1988Mo27).
2226.2 *2*	2^+		J=2 from ΔJ=2 transition to 0^+.
2781.6? *3*			
2857.8 *2*	4^+		J=4 from ΔJ=2 transitions to 2^+, and ΔJ=1 transition to 3^-.
3082.6 *5*	4^+		
3120.5 *3*	5^-		J=5 from ΔJ=2 transition to 3^-.
3177.0 *3*	4^+		
3309.9 *2*	$(4^+,5^+,6^+)$		
3483.6 *5*	6^+	25 ps *9*	J=6 from ΔJ=1 transition to 5^-. $T_{1/2}$: from 1991OhZZ.
3749.1 *3*	4^+		
3772.6 *1*	6^+		J=6 from ΔJ=2 transition to 4^+ and ΔJ=1 transition to 5^-.
3924.3[‡]			
4126.9 *3*	(4^+)		
4235.1 *3*	7^-		
4261.6 *6*	$(5^+,6^+)$		
4389.8 *2*	8^+	127 ps *10*	J=8 from ΔJ=2 transitions to 6^+. $T_{1/2}$: from 1990OhZZ, 1991OhZZ.
4570.5 *4*	$(5^-,6^+)$		
4690.1 *5*			
4751.8 *2*	$(7,8^+)$		
4757.1[‡]			
4846.0 *4*			
4907.2 *3*			
5066.5 *2*	$(7^+,8^+)$		
5118.1 *3*			
5235.6 *10*	$(7,8^+)$		
5507.9 *3*	$(7^+,8^+)$		J^π: (10^+) according to 1995HaZT, 1997RaZZ; supporting arguments not available.
5629.2 *3*			
5900.1 *3*			

[†] From 1987StZX, unless indicated otherwise.
[‡] From 1995HaZT, 1997RaZZ; not reported by 1987StZX.
[#] From Adopted Levels; supporting arguments mainly from $\gamma\gamma(\theta)$ in 1988StZS are given in comments.

^{96}Y β^- decay (9.6 s) 1987StZX (continued)

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(2.34×10^3 *4*)	5900.1	0.7 *1*	5.87 *7*	av Eβ=953 *18*
(2.61×10^3 *4*)	5629.2	0.9 *3*	5.96 *15*	av Eβ=1079 *18*
(2.73×10^3 *4*)	5507.9	5.8 *8*	5.23 *7*	av Eβ=1136 *18*
(3.00×10^3 *4*)	5235.6	1.2 *3*	6.09 *12*	av Eβ=1265 *18*
(3.17×10^3 *4*)	5066.5	4.1 *7*	5.66 *8*	av Eβ=1345 *18*
(3.39×10^3 *4*)	4846.0	0.9 *2*	6.44 *10*	av Eβ=1450 *18*
(3.48×10^3 *4*)	4751.8	2.5 *9*	6.05 *16*	av Eβ=1495 *18*
(3.55×10^3 *4*)	4690.1	0.5 *1*	6.78 *9*	av Eβ=1524 *18*
(3.67×10^3 *4*)	4570.5	0.9 *3*	6.59 *15*	av Eβ=1581 *18*
(3.85×10^3 *4*)	4389.8	80.9 *96*	4.73 *6*	av Eβ=1668 *18*
(4.00×10^3 *4*)	4235.1	1.6 *7*	6.51 *20*	av Eβ=1742 *18*

† From 1987StZX. These are not the same as the Iβ obtained from Iγ normalization=0.0880 and the Iγ balance. However, if I(γ+ce)(1582) is neglected, one obtains an Iγ normalization=0.0893 and if the Iβ thus obtained to the eleven levels from 4235 to 5900 keV are arbitrarily renormalized to add up to 100, one obtains the Iβ from 1987StZX which are higher by about 13.8%.

‡ Absolute intensity per 100 decays.

^{96}Y β^- decay (9.6 s) 1987StZX (continued)

$\gamma(^{96}Zr)$

Iγ normalization: ΣIγ(to g.s.)=100, assuming that the g.s. β^- feeding is zero, and includes a 1.5% contribution from the 1582 keV E0 transition.

E_γ [†]	I_γ [‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[b]	Comments
132.9	10	3309.9	$(4^+,5^+,6^+)$	3177.0	4^+				
146.653[@] *10*	387	1897.6	3^-	1750.6	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* Mult.: ΔJ=1 transition to 2^+.
154.7	5	4389.8	8^+	4235.1	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*
173.7	24	3483.6	6^+	3309.9	$(4^+,5^+,6^+)$	(M1)		0.0452	α(K)=0.0397 *6*; α(L)=0.00456 *7*; α(M)=0.000794 *12*; α(N)=0.0001124 *16*; α(O)=7.81×10^{-6} *11* α(N+..)=0.0001202 *17*
189.4	4	3309.9	$(4^+,5^+,6^+)$	3120.5	5^-				
224.8	4	3082.6	4^+	2857.8	4^+				
227.3	16	3309.9	$(4^+,5^+,6^+)$	3082.6	4^+	E2		0.0569	α(K)=0.0492 *7*; α(L)=0.00641 *9*; α(M)=0.001116 *16*; α(N)=0.0001530 *22*; α(O)=8.73×10^{-6} *13* α(N+..)=0.0001617 *23*
289.0	10	3772.6	6^+	3483.6	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* δ: from γγ(θ) (1987St12).
314.7	7	5066.5	$(7^+,8^+)$	4751.8	$(7,8^+)$				
328.6	6	2226.2	2^+	1897.6	3^-	(E1(+M2))	−0.02 *5*	0.00381 *16*	α(K)=0.00336 *14*; α(L)=0.000372 *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*
335.4	3	4570.5	$(5^-,6^+)$	4235.1	7^-				
363.1	256	3483.6	6^+	3120.5	5^-	E1		0.00291	α(K)=0.00257 *4*; α(L)=0.000284 *4*; α(M)=4.91×10^{-5} *7*; α(N)=6.94×10^{-6} *10*; α(O)=4.78×10^{-7} *7* α(N+..)=7.42×10^{-6} *11* Mult.: ΔJ=1 transition to 5^-.
401.0	3	3483.6	6^+	3082.6	4^+				
441.4	4	5507.9	$(7^+,8^+)$	5066.5	$(7^+,8^+)$				
455.0	4	4690.1		4235.1	7^-				
462.7	5	3772.6	6^+	3309.9	$(4^+,5^+,6^+)$				
475.6	35	2226.2	2^+	1750.6	2^+	M1+E2	−0.09 *+1−2*	0.00360	α(K)=0.00318 *5*; α(L)=0.000354 *5*;

$^{96}_{40}Zr_{56}$-3

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

E_γ[†]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[b]	Comments
									α(M)=6.16×10^{-5} *9*; α(N)=8.75×10^{-6} *13*; α(O)=6.19×10^{-7} *9* α(N+..)=9.36×10^{-6} *14* δ: +0.1 *2* from $\gamma\gamma(\theta)$ (1987St12).
489.0	11	4261.6	(5$^+$,6$^+$)	3772.6	6$^+$				
517.4	12	4907.2		4389.8	8$^+$				
522.6	35	4757.1		4235.1	7$^-$				E$_\gamma$: from difference in energy of initial and final levels; 517.2 keV (1995HaZT, 1997RaZZ). 1987StZX report a 517.4 keV γ with Iγ=12 depopulating the 4907 level which is not seen by 1995HaZT, 1997RaZZ.
600.7	5	5507.9	(7$^+$,8$^+$)	4907.2					
617.2	625	4389.8	8$^+$	3772.6	6$^+$	E2		0.00228	α(K)=0.00201 *3*; α(L)=0.000230 *4*; α(M)=3.99×10^{-5} *6*; α(N)=5.61×10^{-6} *8*; α(O)=3.78×10^{-7} *6* α(N+..)=5.99×10^{-6} *9* Mult.: ΔJ=2 transition to 6$^+$.
626	8	3483.6	6$^+$	2857.8	4$^+$				E$_\gamma$,I$_\gamma$: from 1987St12.
631.45[@] *4*	85	2857.8	4$^+$	2226.2	2$^+$	E2(+M3)	−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* α(N+..)=5.6×10^{-6} *4* Mult.: ΔJ=2 transition to 2$^+$.
643.7	17	2226.2	2$^+$	1582.5	0$^+$	E2		0.00203	α(K)=0.00179 *3*; α(L)=0.000204 *3*; α(M)=3.54×10^{-5} *5*; α(N)=4.99×10^{-6} *7*; α(O)=3.37×10^{-7} *5* α(N+..)=5.33×10^{-6} *8*
652.1	17	3772.6	6$^+$	3120.5	5$^-$	(E1)		6.98×10^{-4}	α(K)=0.000617 *9*; α(L)=6.75×10^{-5} *10*; α(M)=1.169×10^{-5} *17*; α(N)=1.658×10^{-6} *24* α(O)=1.165×10^{-7} *17*; α(N+..)=1.775×10^{-6} *25* Mult.: ΔJ=1 transition to 5$^-$.
676.7	4	5066.5	(7$^+$,8$^+$)	4389.8	8$^+$				
690.0	13	3772.6	6$^+$	3082.6	4$^+$				
719.1	9	4846.0		4126.9	(4$^+$)				
728.3	10	5118.1		4389.8	8$^+$				
750.5	5	5507.9	(7$^+$,8$^+$)	4757.1					E$_\gamma$: from 1995HaZT, 1997RaZZ; not observed by 1987StZX.
751.5	8	4235.1	7$^-$	3483.6	6$^+$				
756.1	11	5507.9	(7$^+$,8$^+$)	4751.8	(7,8$^+$)				
778.0	13	4261.6	(5$^+$,6$^+$)	3483.6	6$^+$				
804.7	18	3924.3		3120.5	5$^-$				E$_\gamma$,I$_\gamma$: from 1995HaZT, 1997RaZZ; 1987StZX show this γ with Iγ=14 depopulating the 5067 level.
804.9	14	5066.5	(7$^+$,8$^+$)	4261.6	(5$^+$,6$^+$)				E$_\gamma$: 1995HaZT, 1997RaZZ show a 804.7 keV γ, Iγ=18 depopulating a 3924.3 level not observed by 1987StZX.
845.8	7	5235.6	(7,8$^+$)	4389.8	8$^+$				
857.4		3082.6	4$^+$	2226.2	2$^+$	[E2]		9.67×10^{-4}	α(K)=0.000852 *12*; α(L)=9.55×10^{-5} *14*; α(M)=1.656×10^{-5} *24*; α(N)=2.34×10^{-6} *4*

$^{96}_{40}Zr_{56}$-4

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

E_γ †	I_γ ‡&	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ#	α b	$I_{(\gamma+ce)}$ a	Comments
										α(O)=1.620×10^{-7} *23*; α(N+..)=2.51×10^{-6} *4* E_γ: from 1995HaZT, 1997RaZZ; not observed by 1987StZX.
884.0 c	8	2781.6?		1897.6	3$^-$					
906.2	230	4389.8	8$^+$	3483.6	6$^+$	E2		8.46×10^{-4}		α(K)=0.000746 *11*; α(L)=8.33×10^{-5} *12*; α(M)=1.445×10^{-5} *21*; α(N)=2.04×10^{-6} *3* α(O)=1.419×10^{-7} *20*; α(N+..)=2.19×10^{-6} *3* Mult.: ΔJ=2 transition to 6$^+$.
914.8	670	3772.6	6$^+$	2857.8	4$^+$	(E2)		8.27×10^{-4}		α(K)=0.000729 *11*; α(L)=8.14×10^{-5} *12*; α(M)=1.412×10^{-5} *20*; α(N)=2.00×10^{-6} *3* α(O)=1.388×10^{-7} *20*; α(N+..)=2.14×10^{-6} *3* Mult.: ΔJ=2 transition to 4$^+$.
960.2	45	2857.8	4$^+$	1897.6	3$^-$	(E1)		3.12×10^{-4}		α(K)=0.000276 *4*; α(L)=3.00×10^{-5} *5*; α(M)=5.19×10^{-6} *8*; α(N)=7.37×10^{-7} *11*; α(O)=5.22×10^{-8} *8* α(N+..)=7.89×10^{-7} *11* Mult.: ΔJ=1 transition to 3$^-$.
979.2	41	4751.8	(7,8$^+$)	3772.6	6$^+$					
1006.4	13	4126.9	(4$^+$)	3120.5	5$^-$					
1107.2	547	2857.8	4$^+$	1750.6	2$^+$	E2(+M3)	−0.03 *3*	5.36×10^{-4} *10*		α(K)=0.000472 *8*; α(L)=5.22×10^{-5} *9*; α(M)=9.06×10^{-6} *16*; α(N)=1.284×10^{-6} *23*; α(O)=9.01×10^{-8} *16* α(N+..)=2.18×10^{-6} *4* Mult.: ΔJ=2 transition to 2$^+$.
1114.6	20	4235.1	7$^-$	3120.5	5$^-$					
1118.1	15	5507.9	(7$^+$,8$^+$)	4389.8	8$^+$					
1179.0	3	4261.6	(5$^+$,6$^+$)	3082.6	4$^+$					
1185.0	39	3082.6	4$^+$	1897.6	3$^-$	E1(+M2)	+0.02 *3*	2.44×10^{-4}		α(K)=0.000186 *3*; α(L)=2.02×10^{-5} *4*; α(M)=3.49×10^{-6} *6*; α(N)=4.97×10^{-7} *9*; α(O)=3.53×10^{-8} *6* α(N+..)=3.43×10^{-5} *5*
1222.9	304	3120.5	5$^-$	1897.6	3$^-$	E2+M3	−0.05 *3*	4.44×10^{-4} *9*		α(K)=0.000382 *8*; α(L)=4.21×10^{-5} *9*; α(M)=7.30×10^{-6} *15*; α(N)=1.037×10^{-6} *21*; α(O)=7.30×10^{-8} *15* α(N+..)=1.248×10^{-5} *18* Mult.: ΔJ=2 transition to 3$^-$.
1239.4	9	5629.2		4389.8	8$^+$					
1246.3	9	5507.9	(7$^+$,8$^+$)	4261.6	(5$^+$,6$^+$)					
1279.4	14	3177.0	4$^+$	1897.6	3$^-$	E1(+M2)	−0.03 *3*	2.77×10^{-4} *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+..)=9.38×10^{-5} *14*

$^{96}_{40}Zr_{56}$-5

^{96}Y β^- decay (9.6 s) 1987StZX (continued)

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

E_γ[†]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[b]	$I_{(\gamma+ce)}$[a]	Comments
1463.0	5	5235.6	(7,8$^+$)	3772.6	6$^+$				
1510.3	7	5900.1		4389.8	8$^+$				
1582.5		1582.5	0$^+$	0.0	0$^+$	E0		1.5	$I_{(\gamma+ce)}$: from Iγ(644) feeding the 1582.5 level.
1582.9	18	5066.5	(7$^+$,8$^+$)	3483.6	6$^+$				
1712.7[c]	5	4570.5	(5$^-$,6$^+$)	2857.8	4$^+$				
1735.3	12	5507.9	(7$^+$,8$^+$)	3772.6	6$^+$				
1750.6	1000	1750.6	2$^+$	0.0	0$^+$	E2	3.98×10^{-4}		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* Mult.: ΔJ=2 transition to 0$^+$.
1851.5	6	3749.1	4$^+$	1897.6	3$^-$				
1897.6	57	1897.6	3$^-$	0.0	0$^+$	[E3]	4.40×10^{-4}		α(K)=0.000268 *4*; α(L)=2.96×10^{-5} *5*; α(M)=5.14×10^{-6} *8*; α(N)=7.30×10^{-7} *11*; α(O)=5.17×10^{-8} *8* α(N+..)=0.0001368 *20*
2226.2	63	2226.2	2$^+$	0.0	0$^+$	E2	5.51×10^{-4}		α(K)=0.0001184 *17*; α(L)=1.282×10^{-5} *18*; α(M)=2.22×10^{-6} *4*; α(N)=3.16×10^{-7} *5*; α(O)=2.26×10^{-8} *4* α(N+..)=0.000417 *6* Mult.: ΔJ=2 transition to 0$^+$.

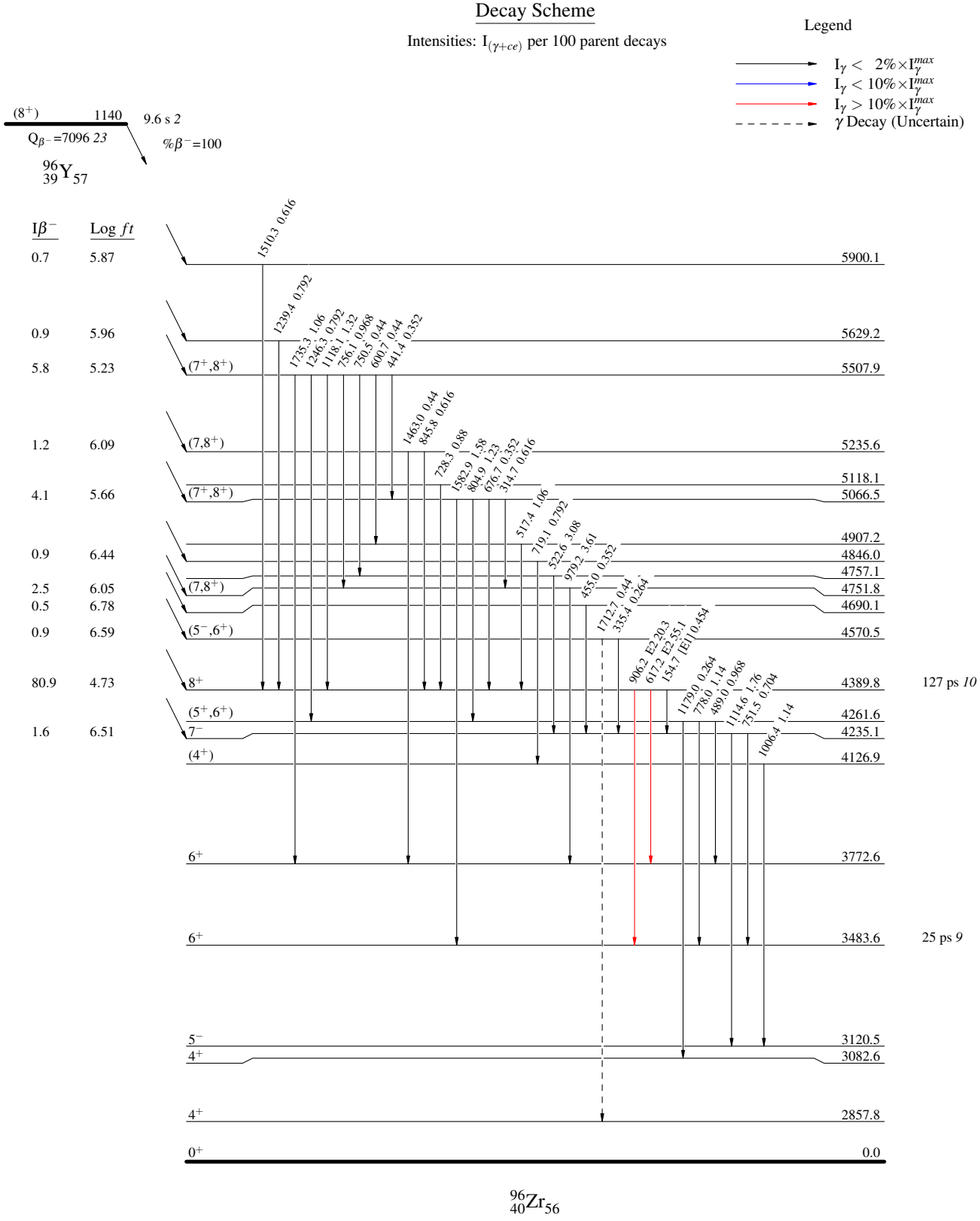
[†] From energy difference of initial and final levels of 1987StZX, unless indicated otherwise. Some Eγ from 1987StZX are not consistent with their level energies.
[‡] From 1987StZX, unless indicated otherwise. Uncertainty not given by authors.
[#] From adopted gammas.
[@] Measured with a curved-crystal diffraction spectrometer (1979Bo26).
[&] For absolute intensity per 100 decays, multiply by 0.0880.
[a] Absolute intensity per 100 decays.
[b] 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.
[c] Placement of transition in the level scheme is uncertain.

$^{96}_{40}Zr_{56}$-6

^{96}Y β^- decay (9.6 s) 1987StZX

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



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

^{96}Y β^- decay (9.6 s) 1987StZX

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays