^{100}Sr β^- decay (200 ms) 1987Wo07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172, 1 (2021)	31-Jan-2021

Parent: ^{100}Sr: E=0.0; $J^\pi=0^+$; $T_{1/2}$=200 ms *2*; $Q(\beta^-)$=7506 *13*; $\%\beta^-$ decay=100.0
^{100}Sr-$T_{1/2}$: From ^{100}Sr Adopted Levels. 193 ms *4* from 1987Wo07.
^{100}Sr-$Q(\beta^-)$: From 2017Wa10.
1987Wo07 (also 1986Pe04,1986Wo01): ^{100}Sr sources were produced at the TRISTAN mass separator facility at Brookhaven National Laboratory by ^{235}U(n,F) reaction. γ rays were detected with Ge(Li) and HPGe detectors and conversion electrons were detected with a Si(Li) detector. Measured Eγ, Iγ, $\gamma\gamma$-coin, E(ce), I(ce), $\beta\gamma$-coin, γ(t). Deduced levels, J, π, parent half-life, conversion coefficients, γ-ray multipolarities, β-decay branching ratios, log *ft*.
Others:
γ, $\gamma\gamma$: 1985Mu07.
β: 1985IaZZ.
$\beta\gamma$: 1984Pa19.
$\beta\gamma\gamma$(t): 1990Ma08.
$T_{1/2}$ and production of ^{100}Sr isotope: 1986Wo01, 1986Wa17, 1983Mu19, 1978Ko29.

^{100}Y Levels

The decay scheme is from $\gamma\gamma$ data of 1987Wo07. It represents a significant improvement over the earlier decay scheme from 1985Mu07.
The following levels proposed by 1985Mu07 have been discarded: 250.1, 260.4, 452.6 and 1125.7. The γ-rays associated with these levels have either been reassigned or have not been seen (1987Wo07).

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0	(1)$^-$	732 ms *5*	$T_{1/2}$: from the Adopted Levels.
10.70[&] *2*	1$^+$		
76.15[&] *3*	(2)$^+$	72[@] ps *7*	
99.16 *2*	(0,1,2)[#]		
172.03[&] *4*	(3$^+$)		
194.98 *2*	(0,1,2$^-$)		
309.83 *3*	(0$^+$,1,2)[#]		
355.75 *4*			
376.07 *3*	(1$^+$,2,3$^+$)[#]		
483.58 *5*	(1$^+$ to 4$^+$)[#]		
698.71 *8*	(1$^+$ to 4$^+$)[#]		
734.03 *6*	(1$^+$,2,3$^+$)[#]		
776.24 *5*			
827.97 *8*	(1$^+$,2,3$^+$)[#]		
849.45 *8*			
860.60 *4*			
861.19 *6*			
974.60 *4*	1$^+$		
1045.70 *13*			
1146.33 *9*			
1149.46 *9*			
1340.74 *6*			
1379.16 *4*	(0$^+$,1,2$^-$)		
1389.85 *11*			
1412.14 *14*	(1$^+$,2,3$^+$)[#]		
1699.99 *10*			

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^{100}Sr β^- decay (200 ms) 1987Wo07 (continued)

^{100}Y Levels (continued)

E(level)[†]	Comments
4749+x	E(level): x<2757 *18* from Q(β^-) (for ^{100}Sr decay)-S(n)(^{100}Y), where Q(β^-)=7506 *13* and S(n)=4749 *13* from 2017Wa10.

[†] From a least-squares fit to Eγ data.
[‡] From the Adopted Levels.
[#] Assignments of 2$^+$, 3 or 4 will not be possible if definite β feeding from 0$^+$ parent is determined in future experiments.
[@] From $\beta\gamma\gamma$(t) (1990Ma08), recommended in the Adopted Levels.
[&] Band(A): K^π=1$^+$, π5/2[422]$\otimes\nu$3/2[411]. This band has been interpreted by 1987Wo07 as a ‘pairing-free’ rotational band, meaning that moment of inertia is nearly equal to that for a rigid spheroid. However, theoretical calculations by 1987Kr02 using Random-phase approximation (RPA) refute this claim, and conclude that pairing is reduced only by 50-60%.

β^- radiations

Q(β^-)=7075 *100* (1988GrZX). Others: 7090 *150* (1984Pa19, same group as 1988GrZX), 7520 *140* (1985IaZZ).

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(1.4×10^3[@] *14*)	4749+x	1.11 *21*		Iβ^-: %β^-n=1.11 *21* for the decay of the ^{100}Sr g.s.
(5806 *13*)	1699.99	<0.59	>6.0	av Eβ=2611.5 *63*
(6094 *13*)	1412.14	<0.50	>6.1	av Eβ=2750.1 *63*
(6116 *13*)	1389.85	<0.27	>6.4	av Eβ=2760.9 *63*
(6127 *13*)	1379.16	<2.8	>5.4	av Eβ=2766.0 *63* Iβ=2.8, log *ft*=5.2 (1987Wo07). Iβ=2.8 *3* (evaluators).
(6165 *13*)	1340.74	<1.10	>5.8	av Eβ=2784.5 *63*
(6357 *13*)	1149.46	<0.45	>6.3	av Eβ=2876.7 *63*
(6360 *13*)	1146.33	<0.17	>6.7	av Eβ=2878.2 *63*
(6460 *13*)	1045.70	<0.15	>6.8	av Eβ=2926.7 *63*
(6531 *13*)	974.60	≈41	≈4.4	av Eβ=2961.0 *63* Iβ=40.7, log *ft*=4.2 (1987Wo07). Iβ=41 *4* (evaluators).
(6645 *13*)	861.19	<0.94	>6.0	av Eβ=3015.6 *63*
(6645 *13*)	860.60	<0.48	>6.3	av Eβ=3015.9 *63*
(6657 *13*)	849.45	<0.33	>6.5	av Eβ=3021.3 *63*
(6678 *13*)	827.97	<0.18	>6.8	av Eβ=3031.6 *63*
(6730 *13*)	776.24	<0.28	>6.6	av Eβ=3056.5 *63*
(6772 *13*)	734.03	<0.99	>6.0	av Eβ=3076.9 *63*
(6807 *13*)	698.71	<0.25	>6.6	av Eβ=3093.9 *63*
(7022 *13*)	483.58	<0.12	>7.0	av Eβ=3197.5 *63*
(7130 *13*)	376.07	<1.1	>6.1	av Eβ=3249.3 *63*
(7150 *13*)	355.75	<0.18	>6.9	av Eβ=3259.1 *63*
(7196[#] *13*)	309.83	<1.0	>6.2	av Eβ=3281.2 *63*
(7311 *13*)	194.98	<3.4	>5.7	av Eβ=3336.5 *63* Iβ=2.8, log *ft*=5.6 (1987Wo07). Iβ=3.4 *6* (evaluators).
(7334[#] *13*)	172.03	<0.9	>6.2	av Eβ=3347.6 *63*
(7407[#] *13*)	99.16	<3.6	>5.7	av Eβ=3382.6 *63*
(7430[#] *13*)	76.15	<3.7	>5.7	av Eβ=3393.7 *63*
(7495 *13*)	10.70	≈44	≈4.6	av Eβ=3425.2 *63* Iβ=42.9, log *ft*=4.5 (1987Wo07). Iβ=44 *10* (evaluators).
(7506[#] *13*)	0.0	<7	>5.4	av Eβ=3430.4 *63*

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^{100}Sr β^- decay (200 ms) 1987Wo07 (continued)

β^- radiations (continued)

† As suggested by 1987Wo07, unobserved transitions can affect the values of β^- feedings that are weak. β^- feedings that are ≈4% or less and corresponding log *ft* values are given as limits. Two strong β feedings are given as approximate.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.
@ Estimated for a range of levels.

$\gamma(^{100}Y)$

Iγ normalization: Deduced by 1987Wo07 from γ-ray spectrum of A=100 mass-separated activities of ^{100}Sr, ^{100}Y and ^{100}Zr in equilibrium with the ion-beam deposition rate, assuming that only ^{100}Rb and ^{100}Sr were present in the ion-beam. For absolute intensity measurement, 1986Wo01 used Iγ(absolute)=31% *4* (1981DeYV) for 504γ in ^{100}Nb from ^{100}Zr β^- decay. The corresponding absolute intensity of 30% *4* in 2007Ri01 corroborates the value in 1981DeYV, while 19% *2* in 1989WaZV seems discrepant. Iγ normalization=0.22 *1* gives β^- feeding to g.s. as <7%. The delayed neutron decay is 1.11% *21*.

The following γ rays with energy (intensity) reported by 1985Mu07 have been omitted due to lack of confirmation: 78 (1.5), 94, 117, 125 (2.2), 174.0 (4.3), 234, 299, 354, 452.5 (0.7), 763.0 (1.5), 770.0 (3.0), 869, 1060.0 (0.72). 1987Wo07 state that peaks corresponding to some of these γ energies appear in the $\gamma\gamma$-coin spectra because of Compton scattering effects.

%β^-n=0.73 *3* (1986Wa17).

E_γ	I_γ[†&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ	α[a]	Comments
10.68 *3*	44 *4*	10.70	1^+	0.0	$(1)^-$	E1		8.55 *14*	α(L)=7.21 *12*; α(M)=1.197 *20*; α(N)=0.1389 *23*; α(O)=0.00506 *8* Mult.: large α values for multipolarities other than E1 or M1 will make this transition almost fully converted which will not allow this transition to be seen as photons. For M1 multipolarity (with α=15.4), the required β feeding to the 10.7-keV level would be almost 100% from intensity balance, which is highly unlikely. Thus E1 is the only choice that is consistent with the measured photon intensity of 10.68γ, and intensity balance considerations.
65.46 *3*	69 *5*	76.15	$(2)^+$	10.70	1^+	M1(+E2)	<0.1	0.62 *2*	I_γ: 1985Mu07 give Iγ=145. 1987Wo07 were aware of this large discrepancy. Their value of Iγ=69 *5* is a weighted average of three independent measurements. Also a larger value of Iγ would imply direct β^- feeding which would be inconsistent with ΔJ=2 and $\Delta\pi$=no. Mult.,δ: from α(K)exp=0.53 *5*, α(L)exp=0.064 *10* (1987Wo07).
66.0[‡] *6*	1.11[‡] *15*	376.07	$(1^+,2,3^+)$	309.83	$(0^+,1,2)$	[D,E2]		2.6 *24*	
88.50 *3*	6.4 *3*	99.16	(0,1,2)	10.70	1^+	[D,E2]		0.9 *7*	
95.91[#] *4*	3.68[#] *25*	194.98	$(0,1,2^-)$	99.16	(0,1,2)	[D,E2]		0.7 *5*	
95.94[#] *4*	3.13[#] *16*	172.03	(3^+)	76.15	$(2)^+$	[D,E2]		0.7 *5*	I_γ: 1985Mu07 give 12 for an unresolved doublet.
99.20 *3*	5.75 *25*	99.16	(0,1,2)	0.0	$(1)^-$	[D,E2]		0.6 *5*	I_γ: 10 in 1985Mu07.
107.43[#] *11*	0.48[#] *7*	483.58	$(1^+$ to $4^+)$	376.07	$(1^+,2,3^+)$	[D,E2]		0.5 *4*	
114.86 *5*	0.88 *6*	309.83	$(0^+,1,2)$	194.98	$(0,1,2^-)$	[D,E2]		0.4 *3*	I_γ: 1985Mu07 give 5.1.
127.65[‡] *11*	0.13[‡] *2*	483.58	$(1^+$ to $4^+)$	355.75		[D,E2]		0.24 *19*	
181.17 *3*	2.46 *12*	376.07	$(1^+,2,3^+)$	194.98	$(0,1,2^-)$	[D,E2]		0.07 *5*	I_γ: 1985Mu07 give 7.2.
195.01 *3*	15.9 *7*	194.98	$(0,1,2^-)$	0.0	$(1)^-$				
204.11 *8*	0.26 *4*	376.07	$(1^+,2,3^+)$	172.03	(3^+)				
233.77 *4*	1.84 *10*	309.83	$(0^+,1,2)$	76.15	$(2)^+$				

$\gamma(^{100}$Y) (continued)

E_γ	I_γ[†&]	E_i(level)	J_i^π	E_f	J_f^π
240.64[b] *8*	0.77 *7*	1389.85		1149.46	
256.63 *4*	2.01 *10*	355.75		99.16	(0,1,2)
276.90 *6*	0.94 *9*	376.07	$(1^+,2,3^+)$	99.16	(0,1,2)
285.11 *8*	0.39 *6*	1146.33		861.19	
288.7[‡] *3*	0.04[‡] *1*	483.58	$(1^+$ to $4^+)$	194.98	$(0,1,2^-)$
299.03[#] *5*	5.6[#] *4*	309.83	$(0^+,1,2)$	10.70	1^+
299.70[‡] *6*	1.10[‡] *7*	376.07	$(1^+,2,3^+)$	76.15	$(2)^+$
309.68[#] *6*	3.75[#] *22*	309.83	$(0^+,1,2)$	0.0	$(1)^-$
311.62[‡] *19*	0.28[‡] *6*	483.58	$(1^+$ to $4^+)$	172.03	(3^+)
365.31 *4*	3.22 *17*	376.07	$(1^+,2,3^+)$	10.70	1^+
376.96 *7*	1.58 *11*	860.60		483.58	$(1^+$ to $4^+)$
384.55[#] *14*	0.42[#] *7*	483.58	$(1^+$ to $4^+)$	99.16	(0,1,2)
407.43 *8*	0.52 *6*	483.58	$(1^+$ to $4^+)$	76.15	$(2)^+$
466.46 *6*	2.61 *17*	776.24		309.83	$(0^+,1,2)$
473.33[#] *15*	0.80[#] *12*	849.45		376.07	$(1^+,2,3^+)$
484.77 *8*	1.41 *12*	860.60		376.07	$(1^+,2,3^+)$
505.09[‡] *8*	1.04[‡] *9*	860.60		355.75	
518.67 *6*	3.07 *17*	1379.16	$(0^+,1,2^-)$	860.60	
526.72[‡] *8*	0.36[‡] *6*	698.71	$(1^+$ to $4^+)$	172.03	(3^+)
539.64 *8*	0.71 *9*	849.45		309.83	$(0^+,1,2)$
550.45[‡] *19*	0.33[‡] *6*	860.60		309.83	$(0^+,1,2)$
562.08[‡] *18*	0.13[‡] *3*	734.03	$(1^+,2,3^+)$	172.03	(3^+)
564.56[‡] *7*	0.96[‡] *7*	1340.74		776.24	
581.26 *6*	1.65[@] *10*	776.24		194.98	$(0,1,2^-)$
602.95 *9*	2.00 *17*	1379.16	$(0^+,1,2^-)$	776.24	
622.47[‡] *11*	0.78[‡] *9*	698.71	$(1^+$ to $4^+)$	76.15	$(2)^+$
633.04[‡] *10*	0.39[‡] *4*	827.97	$(1^+,2,3^+)$	194.98	$(0,1,2^-)$
655.87[‡] *11*	0.44[‡] *7*	827.97	$(1^+,2,3^+)$	172.03	(3^+)
657.84 *9*	1.01 *10*	734.03	$(1^+,2,3^+)$	76.15	$(2)^+$
665.45[‡] *8*	0.92[‡] *9*	860.60		194.98	$(0,1,2^-)$
723.33 *6*	3.4 *3*	734.03	$(1^+,2,3^+)$	10.70	1^+
762.06 *6*	2.9 *3*	861.19		99.16	(0,1,2)
861.02 *11*	1.81 *20*	861.19		0.0	$(1)^-$
873.90[‡] *14*	0.44[‡] *9*	1045.70		172.03	(3^+)
875.45[#] *11*	1.56[#] *17*	974.60	1^+	99.16	(0,1,2)
898.50 *4*	86 *4*	974.60	1^+	76.15	$(2)^+$
951.46[‡] *16*	0.38[‡] *6*	1146.33		194.98	$(0,1,2^-)$
963.85 *4*	100 *4*	974.60	1^+	10.70	1^+
964.57[‡] *8*	3.2[‡] *3*	1340.74		376.07	$(1^+,2,3^+)$
969.02[‡] *21*	0.26[‡] *6*	1045.70		76.15	$(2)^+$
1003.04 *11*	1.15 *22*	1379.16	$(0^+,1,2^-)$	376.07	$(1^+,2,3^+)$
1069.24 *6*	2.97 *22*	1379.16	$(0^+,1,2^-)$	309.83	$(0^+,1,2)$
1073.31 *8*	2.04 *12*	1149.46		76.15	$(2)^+$
1183.90[‡] *17*	0.36[‡] *10*	1379.16	$(0^+,1,2^-)$	194.98	$(0,1,2^-)$
1240.12[#] *14*	1.54[#] *16*	1412.14	$(1^+,2,3^+)$	172.03	(3^+)
1241.66[‡] *19*	0.87[‡] *15*	1340.74		99.16	(0,1,2)
1280.08[#] *17*	0.71[#] *17*	1379.16	$(0^+,1,2^-)$	99.16	(0,1,2)
1302.89[#] *16*	0.54[#] *7*	1379.16	$(0^+,1,2^-)$	76.15	$(2)^+$
1313.70 *10*	1.25 *9*	1389.85		76.15	$(2)^+$
1379.25 *15*	1.88 *22*	1379.16	$(0^+,1,2^-)$	0.0	$(1)^-$
1401.2[#] *4*	0.77[#] *20*	1412.14	$(1^+,2,3^+)$	10.70	1^+
1623.78 *10*	2.12 *13*	1699.99		76.15	$(2)^+$
1689.61 *25*	0.57 *16*	1699.99		10.70	1^+

[†] Values from 1985Mu07 are given under comments for some of the γ rays that differ significantly from those in 1987Wo07. The discrepancy may be due to problems in the detector efficiency curve, especially at low energies.

[‡] From $\gamma\gamma$-coin data (1987Wo07).

[#] From average of γ and $\gamma\gamma$-coin data (1987Wo07).

[@] 1985Mu07 give 5.8.

[&] For absolute intensity per 100 decays, multiply by 0.22 *1*.

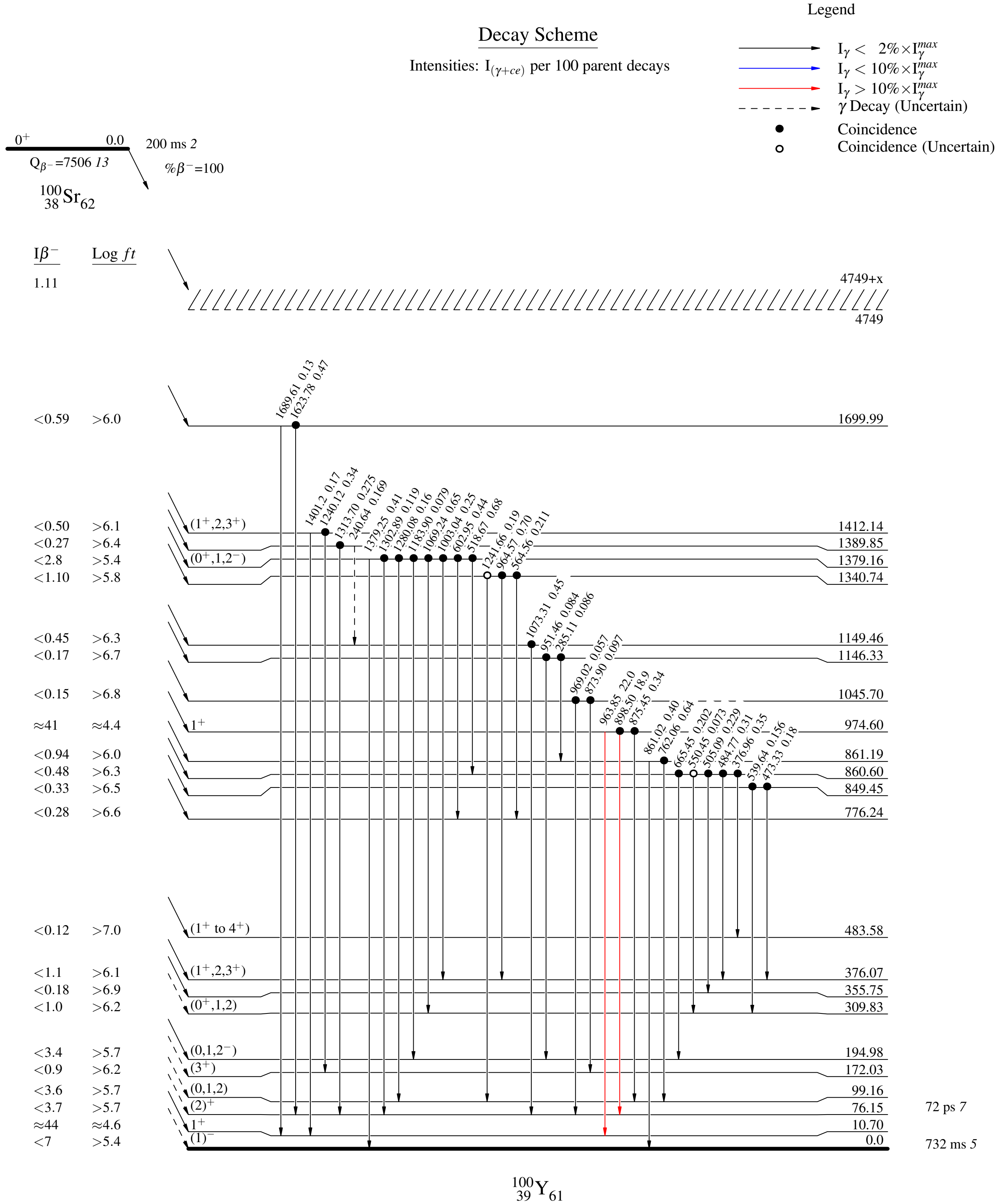
[a] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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

^{100}Sr β^- decay (200 ms) 1987Wo07

Decay Scheme

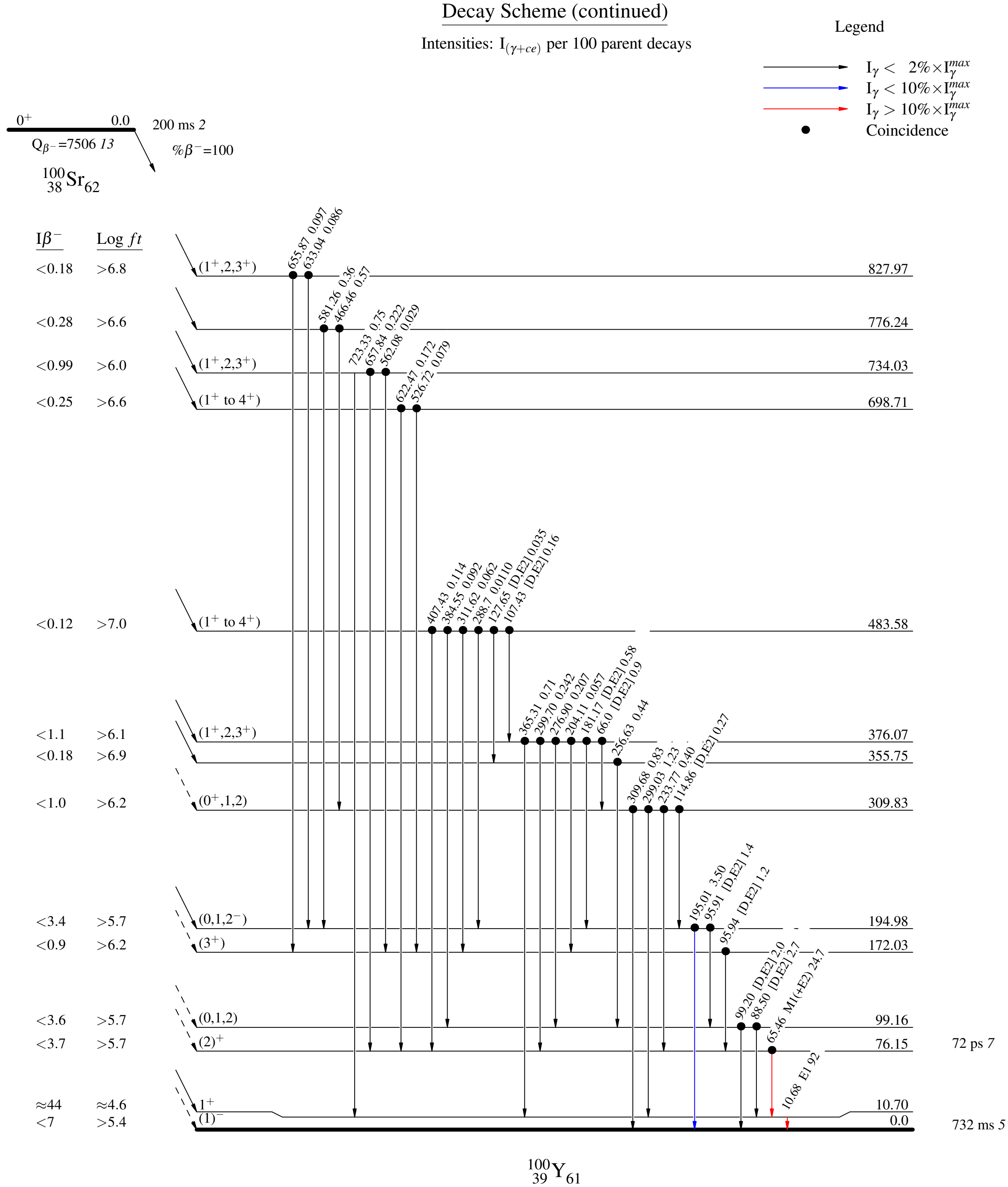
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{100}Sr β^- decay (200 ms) 1987Wo07

Decay Scheme (continued)

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



^{100}Sr β^- decay (200 ms) 1987Wo07