^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 112, 1163 (2011)	15-Dec-2010

Parent: ^{93}Sr: E=0.0; J$^\pi$=5/2$^+$; T$_{1/2}$=7.43 min *3*; Q(β^-)=4140 *12*; %β^- decay=100.0

Others: 1997Gr09, 1996Gr20, 1986Ka20, 1983Ia02, 1979Bo26, 1978St02, 1976BiZL, 1975Ca01, 1974Sc39, 1972Am01, 1971Ca07, 1970MaZC, 1965Ba04.

1996Gr20, 1997Gr09: total absorption γ spectrometer (TAGS) (NaI(Tl) well detector with Si e-detector in well) operated in singles or in $4\pi\gamma$-β coin mode, summed-Eγ resolution≈5%; deduced β^- feeding to (g.s.+759 level) (1996Gr20; supersedes 1996GrZZ), β^- feeding to excited states (1997Gr09; supersedes 1996GrZY).

1979Bo26: curved crystal spectrometer; measured Eγ (4 lines).

1977Bi01: Ge(Li); measured Eγ, Iγ (161 lines), $\gamma\gamma$ coin; see also 1976BiZL for detailed $\gamma\gamma$ coin data.

1974Ac04: Ge(Li) and Si(Li); measured Eγ, Iγ (77 lines), $\gamma\gamma$ coin, α(K)exp (relative to ^{85}Kr(304γ) and ^{85}Rb(151γ)).

1974Sc39: Eγ, Iγ, $\gamma\gamma$ coin, $\beta\gamma$ coin, internal conversion from Kα x ray.

1972He41: Ge(Li), scin; measured Eγ, Iγ (74 lines), $\gamma\gamma$ coin, β^- spectra, $\beta\gamma$ coin.

The adopted decay scheme is based on that of 1977Bi01 and, for E(level)<2850, it is supported by extensive coin information. The schemes proposed by 1977Bi01 and 1972He41 are in excellent agreement; schemes from 1977Bi01 and 1974Ac04 have nothing in common for E(level)>2900, but are reasonably consistent for lower E(level). The evaluator has relocated the 776γ and placed the 1786γ, based on level energy differences. The level proposed by 1977Bi01 at 4263.67 *15* keV (Iβ=0.49% 5, Eγ=1609.8, 1899.5, 2172.0, 2985.7) has an energy exceeding Q(β^-) in 2003Au03, and that at 4119.68 *23* (Iβ=0.14% 2, Eγ=2983.5, 2811.3, 2472.7) has an energy so close to Q(β^-) that log *ft* would be unrealistically low; the evaluator assumes that the associated gammas are misplaced in 1977Bi01. The total unplaced Iγ is then≈2.1%. Placement of the 2688γ is now shown as tentative (see comment on that transition).

Some further modification of the decay scheme of 1977Bi01 is required in order to obtain consistency with the total absorption γ spectrometer (TAGS) data of 1997Gr09. Specifically, the TAGS data indicate that: (i) the 590 level is fed by a branch of≈2%; (ii) there is≈1.5% feeding of an unknown level (or levels) near 2200 keV; (iii) the present level scheme significantly overestimates feeding to levels having E>3800; (iv) significant feeding (≈2.0%) exists to levels with E=3200-3800, none of which is present in the level scheme of 1977Bi01. The evaluator is unable to devise a unique set of new levels deexcited by presently unplaced gammas which would remove the above inconsistencies. However, levels with E>3800 (and their deexciting gammas) are now indicated as tentative since the TAGS data imply negligible feeding to E>3800 levels. Note that the adopted decay scheme implies a total energy deposit of 4290 *80* cf. 4140 *12* from Q⨉Branching.

^{93}Y Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[‡]	Comments
0.0	1/2$^-$	10.18 h *8*	
590.219 *21*	(3/2)$^-$	<0.13 ns	T$_{1/2}$: from 1972Mc04.
758.719 *21*	(9/2)$^+$	0.82 s *4*	
875.85 *3*	5/2$^-$		
1135.99 *4*	(3/2$^+$,5/2$^-$)		
1277.94 *6*	(1/2$^-$,3/2,5/2$^-$)		
1300.521 *25*	(3/2$^+$,5/2$^-$)		
1308.56 *5*	(1/2$^-$,3/2,5/2$^-$)		
1542.73 *10*	(1/2,3/2,5/2$^-$)		
1646.98 *4*	3/2,5/2,7/2		
1695.91 *9*	(1/2$^-$,3/2,5/2)		
1786.47 *5*	(1/2$^-$,3/2,5/2$^-$)		
1852.67 *5*			
1911.46 *4*	(1/2$^-$,3/2,5/2$^-$)		
2056.57 *9*	(1/2$^-$,3/2,5/2$^-$)		Iβ to this level is −0.13 *7* from intensity balance.
2091.35 *5*			
2093.25 *5*			
2129.11 *14*	(1/2$^-$,3/2,5/2$^-$)		
≈2200[#]			

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^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41 (continued)

^{93}Y Levels (continued)

E(level)[†]	J^π[‡]	Comments
2355.58 *6*	(3/2,5/2$^-$)	
2364.88 *7*	(3/2,5/2$^-$)	
2543.93 *7*	3/2$^-$	
2569.95 *5*	3/2$^+$,5/2$^+$,7/2$^+$	
2575.04 *4*	(3/2$^+$)	
2653.91 *11*	(1/2,3/2,5/2)	
2687.55 *4*	3/2$^+$,5/2$^+$,7/2$^+$	
2769.99 *5*	(3/2$^+$)	
2778.06 *21*		
2783.54 *6*	3/2$^{(+)}$ to 7/2$^{(+)}$	
2820.65 *7*	(3/2$^+$)	
2886.52 *9*	(3/2,5/2$^-$)	
3007.05 *9*	(3/2,5/2$^-$)	
3116.05 *14*	(3/2,5/2$^-$)	
≈3200[#]		
≈3300[#]		
≈3400[#]		
≈3500[#]		
≈3600[#]		
≈3700[#]		
≈3800[#]		E(level): may include the 3825 level of 1977Bi01; however, only the 1972γ placed from that level is weak enough to be consistent with the β^- feeding deduced in 1997Gr09.
3824.5? *4*		See comment on 2688γ from 2688 level. E(level): may be included in E≈3800 energy bin of TAGS data.
3871.31? *22*		
3894.9? *3*		

[†] From least-squares fit to Eγ, omitting 2688γ (5σ from expected value), 910γ, 1122γ (4σ from expected Eγ) and 1104γ, 927γ (3σ from expected Eγ). Based on the TAGS data of 1997Gr09, additional levels with E≈2200 and 3200-3800 keV are fed in this decay, but the summed-Eγ resolution was inadequate to determine specific level energy values, and their deexcitation gammas are unknown. These levels are designated here by the centroid energy for≈100 keV wide energy bins within which at least one level lies, for the purpose of indicating the β strength feeding them.

[‡] From Adopted Levels.

[#] Not a discrete level. The energy indicated here is the centroid of an energy bin of typically≈100 keV width which encompasses a level or levels fed in β^- decay with the summed Iβ indicated; from total absorption γ spectroscopy (1997Gr09). Neither specific level energies nor deexcitation γ energies are presently known.

β^- radiations

<E_β>=950 40 (1990Ru05), 900 30 (1982Al01); for the adopted decay scheme, <E_β>=801 *40* is calculated using the code RADLST and the decay scheme adopted here.

E(decay)[†]	E(level)	$I\beta^-$[‡a]	Log *ft*	Comments
(245[b] *12*)	3894.9?	0.12 *7*	4.7 *3*	av Eβ=69.6 *39* $I\beta^-$: ≈0% from TAGS data (1997Gr09).
(269[b] *12*)	3871.31?	0.10 *6*	4.9 *3*	av Eβ=77.1 *39* $I\beta^-$: ≈0% from TAGS data (1997Gr09).

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^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41 (continued)

β^- radiations (continued)

E(decay)[†]	E(level)	Iβ^-[‡a]	Log *ft*	Comments
(316[b] *12*)	3824.5?	0.10 *7*	5.1 *3*	av Eβ=92.5 *40* Iβ^-: ≈0% from TAGS data (1997Gr09).
(340 *12*)	≈3800	0.046[&]		
(440 *12*)	≈3700	0.067[&]		
(540 *12*)	≈3600	0.092[&]		
(640 *12*)	≈3500	0.28[&]		
(740 *12*)	≈3400	1.03[&]		
(840 *12*)	≈3300	0.41[&]		
(940 *12*)	≈3200	0.103[&]		
(1024 *12*)	3116.05	0.39 *4*	6.35 *5*	av Eβ=364.9 *51* Iβ^-: 0.154% from TAGS data (1997Gr09).
(1133 *12*)	3007.05	1.33 *10*	5.98 *4*	av Eβ=411.2 *52* Iβ^-: 0.82% from TAGS data (1997Gr09).
(1253 *12*)	2886.52	1.29 *9*	6.16 *4*	av Eβ=463.2 *53* Iβ^-: 1.30% from TAGS data (1997Gr09).
(1319 *12*)	2820.65	3.8 *3*	5.78 *4*	av Eβ=491.9 *53* Iβ^-: 3.86% from TAGS data (1997Gr09).
(1356 *12*)	2783.54	3.16 *19*	5.91 *3*	av Eβ=508.2 *53* Iβ^-: 2.83% from TAGS data (1997Gr09).
(1370 *12*)	2769.99	7.7 *5*	5.54 *4*	av Eβ=514.2 *53* Iβ^-: 6.92% from TAGS data (1997Gr09).
(1452 *12*)	2687.55	17.3 *14*	5.29 *4*	av Eβ=550.6 *54* Iβ^-: 15.93% from TAGS data (1997Gr09).
(1565 *12*)	2575.04	11.4 *7*	5.60 *3*	av Eβ=600.8 *54* Iβ^-: 10.17% from TAGS data (1997Gr09).
(1570 *12*)	2569.95	11.6 *7*	5.59 *3*	av Eβ=603.1 *54* E(decay): 1560 *250* (1978St02). Iβ^-: 10.35% from TAGS data (1997Gr09).
(1596 *12*)	2543.93	3.8 *3*	6.11 *4*	av Eβ=614.8 *54* Iβ^-: 3.45% from TAGS data (1997Gr09).
(1775 *12*)	2364.88	2.09 *25*	6.55 *6*	av Eβ=695.7 *55* Iβ^-: 4.56% from TAGS data (1997Gr09).
(1784 *12*)	2355.58	1.15 *10*	6.82 *4*	av Eβ=699.9 *55* Iβ^-: 1.40% from TAGS data (1997Gr09).
(1940 *12*)	≈2200	1.54[&]		
(2011 *12*)	2129.11	0.41 *18*	7.48 *19*	av Eβ=803.6 *56* Iβ^-: 0.46% from TAGS data (1997Gr09).
(2229 *12*)	1911.46	0.95 *20*	7.30 *10*	av Eβ=904.3 *56* Iβ^-: 0.96% from TAGS data (1997Gr09).
(2354 *12*)	1786.47	0.37 *12*	7.81 *15*	av Eβ=962.5 *56* Iβ^-: 0.51% from TAGS data (1997Gr09). Additional information 1.
(2444 *12*)	1695.91	0.35 *4*	7.90 *5*	av Eβ=1004.8 *57* Iβ^-: 0.56% from TAGS data (1997Gr09).
(2493 *12*)	1646.98	15.7 *14*	6.28 *4*	av Eβ=1027.7 *57* E(decay): 2500 *200* (1978St02), 2490 *50* (1983Ia02). Iβ^-: 14.05% from TAGS data (1997Gr09).
(2831[b] *12*)	1308.56	1.5 *3*	7.54 *9*	av Eβ=1186.9 *57* Iβ^-: 1.47% from TAGS data (1997Gr09).
(2839 *12*)	1300.521	3.9 *13*	7.13 *15*	av Eβ=1190.7 *57* E(decay): 2710 *200* (1978St02). Iβ^-: 4.0% from TAGS data (1997Gr09).
(2862[b] *12*)	1277.94	0.64 *11*	7.93 *8*	av Eβ=1201.4 *57* Iβ^-: 0.65% from TAGS data (1997Gr09).

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$^{93}Sr\ \beta^-$ decay 1977Bi01,1974Ac04,1972He41 (continued)

β^- radiations (continued)

E(decay)[†]	E(level)	$I\beta^-$[‡a]	Log *ft*	Comments
(3004 *12*)	1135.99	2.6 *5*	7.41 *9*	av Eβ=1268.5 *57* E(decay): 2875 *200* (1978St02). Iβ⁻: 1.90% from TAGS data (1997Gr09). See also the comment on 2688γ from 2688 level.
(3264 *12*)	875.85	2.2 *15*	7.6 *3*	av Eβ=1392.0 *57* E(decay): 3180 *250* (1978St02). Iβ⁻: 2.26% from TAGS data (1997Gr09).
(3381 *12*)	758.719	≤7.2[@]	≥7.2	av Eβ=1447.8 *58* Log *ft*: log *ft*>11.0 expected for a $5/2^+$ to $9/2^+$ transition.
(3550[b] *12*)	590.219	≈2.1	≈7.8	av Eβ=1528.1 *58* Iβ⁻: 2.05% from TAGS data (1997Gr09); −1 *5* from I(γ+ce) balance.
(4140[b] *12*)	0.0	≤4.5[#]	≥9.4[1u]	av Eβ=1806.4 *58* E(decay): β⁻ end-point energy: 4150 *70* (1970MaZC), 4150 *120* (1978St02). log *ft*>8.5 implies Iβ<37%.

[†] β end-point energies from γ-gated β spectra (1978St02) are given In comments. End-point energies are also reported by 1983Ia02, 1974Sc39, 1972He41, 1970MaZC, 1965Ba04.

[‡] From I(γ+ce) intensity balance, except as noted. Independent Iβ values (uncertainty unstated) are available, as a function of excitation energy, from the total absorption γ spectrometry data of 1997Gr09, and these are given in comments; agreement is, in general, good, with several noted exceptions.

[#] No g.s. β⁻ feeding confirmed. Iβ(g.s.)<1% estimated by 1974Sc39 from difference between direct β⁻ spectrum and β⁻ spectrum gated by Eγ>50 keV. Iβ(g.s.)≈4.5% from multi-branch fit to total β⁻ spectrum (1983Ia02); however, branches to other levels included in fit do not agree well with decay scheme adopted here. The evaluator adopts Iβ(g.s.)≤4.5.

[@] Iβ(g.s.+759)=5.8% 14 from 4πγ-β coin (1996Gr20). Combining this with Iβ(g.s.)≤4.5%, evaluator adopts Iβ(759)≤7.2%. From γ-intensity balance, Iβ(759)=7.3% 24 is obtained; even if all the unplaced Iγ fed the 759 level (which seems extremely unlikely) Iβ(759) would Be 5.1% 24, further supporting 1974Sc39′s estimate of little, if any, β feeding to g.s. note that log *ft*>11.0, expected for a ΔJ=2, Δπ=No transition, would imply Iβ(759)<0.001%, a value that is difficult to reconcile with observed I(γ+ce) imbalance.

[&] From TAGS data (1997Gr09); may represent feeding to one level or to several levels of undetermined energy, lying within an energy bin typically≈100 keV wide and centered at the level energy indicated.

[a] Absolute intensity per 100 decays.

[b] Existence of this branch is questionable.

γ(^{93}Y)

Iγ normalization: From Σ(I(γ+ce) to g.s.)=99.5% 5, based on Iβ(g.s.)<1% (1974Sc39).
Eγ for several placed γ rays deviates significantly from the least-squares adjusted value; this may indicate the existence of doublets.
1977Bi01 observe more than twice as many γ rays as 1972He41 or 1974Ac04 and resolve nine multiplets reported as single lines in prior studies. The evaluator, therefore, omits γ rays reported by 1974Ac04 alone (Eγ=814.64, 843.93, 935.11, 1006.2, 1803.7, 2196.1, 2359.5, 3414.2, 3972.9).
<E$_\gamma$>=1760 70 (1990Ru05) cf. 2264 *40* calculated for the decay scheme presented here using the RADLST code.

E$_\gamma$[‡]	I$_\gamma$[‡b]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[†]	α[c]	Comments
166.6 *3*	9.2 *24*	2820.65	(3/2$^+$)	2653.91	(1/2,3/2,5/2)			
168.499[#] *4*	271[#] *15*	758.719	(9/2)$^+$	590.219	(3/2)$^-$	E3	0.952	α(K)exp=0.73 *3* α(K)=0.755 *11*; α(L)=0.1649 *23*; α(M)=0.0287 *4*; α(N+..)=0.00361 *5* α(N)=0.00349 *5*; α(O)=0.0001144 *16* E$_\gamma$: from 1979Bo26. Others: 168.69 *5* (1977Bi01), 168.45 *6* (1974Ac04; for doublet). α(K)exp: weighted average of 0.72 *7* (1972Mc04), 0.73 *5* (1974Sc39), 0.67 *7* (1974Ac04), 0.81 *7* (1986Ka20); K/(L+...)=3.62 *23* (1974Ac04).
260.12[#] *5*	109[#] *6*	1135.99	(3/2$^+$,5/2$^-$)	875.85	5/2$^-$			E$_\gamma$: others: 260.12 *4* (1979Bo26), 260.14 *6* (1974Ac04).
285.65[#] *7*	4.0[#] *3*	875.85	5/2$^-$	590.219	(3/2)$^-$			
332.04 *7*	5.2 *4*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	2355.58	(3/2,5/2$^-$)			
342.9 *4*	1.1 *4*	2886.52	(3/2,5/2$^-$)	2543.93	3/2$^-$			
346.49[#] *5*	48.2[#] *25*	1646.98	3/2,5/2,7/2	1300.521	(3/2$^+$,5/2$^-$)			
377.36[#] *6*	21.8[#] *14*	1135.99	(3/2$^+$,5/2$^-$)	758.719	(9/2)$^+$			
406.71[#] *10*	6.3[#] *6*	1542.73	(1/2,3/2,5/2$^-$)	1135.99	(3/2$^+$,5/2$^-$)			
424.70 *13*	3.8 *5*	1300.521	(3/2$^+$,5/2$^-$)	875.85	5/2$^-$			
428.03 *21*	2.2 *4*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	2355.58	(3/2,5/2$^-$)			
432.67[#] *6*	21.8[#] *13*	1308.56	(1/2$^-$,3/2,5/2$^-$)	875.85	5/2$^-$			
440.80 *18*	2.9 *6*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	2129.11	(1/2$^-$,3/2,5/2$^-$)			
446.20[#] *6*	34.7[#] *19*	2093.25		1646.98	3/2,5/2,7/2			
481.96 *10*	16.7 *15*	2575.04	(3/2$^+$)	2093.25				
483.73[#] *8*	24.5[#] *18*	2575.04	(3/2$^+$)	2091.35				
486.7 *4*	1.8 *7*	2543.93	3/2$^-$	2056.57	(1/2$^-$,3/2,5/2$^-$)			
518.50 *15*	1.9 *3*	2575.04	(3/2$^+$)	2056.57	(1/2$^-$,3/2,5/2$^-$)			
541.89[#] *6*	10.7[#] *6*	1300.521	(3/2$^+$,5/2$^-$)	758.719	(9/2)$^+$			
545.81[#] *7*	5.8[#] *4*	1135.99	(3/2$^+$,5/2$^-$)	590.219	(3/2)$^-$			
559.92 *8*	3.0 *3*	1695.91	(1/2$^-$,3/2,5/2)	1135.99	(3/2$^+$,5/2$^-$)			
571.96 *16*	3.1 *4*	3116.05	(3/2,5/2$^-$)	2543.93	3/2$^-$			
586.5 *4*	6.6 *23*	2129.11	(1/2$^-$,3/2,5/2$^-$)	1542.73	(1/2,3/2,5/2$^-$)			

From ENSDF

$\gamma(^{93}$Y) (continued)

E_γ [‡]	I_γ [‡b]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [†]	α [c]	Comments
590.238[#] *23*	1000[#] *55*	590.219	(3/2)$^-$	0.0	1/2$^-$	M1	0.00197 *3*	α(K)exp=0.0016 *4* α(K)=0.001743 *25*; α(L)=0.000191 *3*; α(M)=3.27×10^{-5} *5*; α(N+..)=4.71×10^{-6} *7* α(N)=4.40×10^{-6} *7*; α(O)=3.09×10^{-7} *5* α(K)exp: from 1974Ac04; implies mult.=M1(+E2), δ<1.4. E_γ: from 1979Bo26. Others: 590.28 *5* (1977Bi01), 590.18 *6* (1974Ac04). %Iγ=67.7 *17* assuming recommended decay scheme normalization.
593.81 *18*	16.4 *21*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	2093.25				
596.15 *13*	19.6 *22*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	2091.35				
610.93[#] *6*	16.0[#] *10*	1911.46	(1/2$^-$,3/2,5/2$^-$)	1300.521	(3/2$^+$,5/2$^-$)			
630.97 *16*	2.9 *4*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	2056.57	(1/2$^-$,3/2,5/2$^-$)			
633.5 *3*	1.6 *3*	1911.46	(1/2$^-$,3/2,5/2$^-$)	1277.94	(1/2$^-$,3/2,5/2$^-$)			
650.56 *15*	2.8 *3*	1786.47	(1/2$^-$,3/2,5/2$^-$)	1135.99	(3/2$^+$,5/2$^-$)			
658.56 *11*	6.2 *6*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	1911.46	(1/2$^-$,3/2,5/2$^-$)			
663.58[#] *6*	24.2[#] *14*	2575.04	(3/2$^+$)	1911.46	(1/2$^-$,3/2,5/2$^-$)			
687.79[#] *11*	9.8[#] *9*	1277.94	(1/2$^-$,3/2,5/2$^-$)	590.219	(3/2)$^-$			
690.06[#] *12*	14.9[#] *12*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	2093.25				
692.0 *4*	3.3 *9*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	2091.35				
710.312[#] *17*	320[#] *17*	1300.521	(3/2$^+$,5/2$^-$)	590.219	(3/2)$^-$			E_γ: from 1979Bo26. Others: 710.40 *5* (1977Bi01), 710.19 *10* (1974Ac04).
716.8 *5*	4.3 *23*	1852.67		1135.99	(3/2$^+$,5/2$^-$)			
718.33 *12*	22 *3*	1308.56	(1/2$^-$,3/2,5/2$^-$)	590.219	(3/2)$^-$			
764.8 *5*	0.44 *17*	2820.65	(3/2$^+$)	2056.57	(1/2$^-$,3/2,5/2$^-$)			
771.19[#] *6*	17.1[#] *10*	1646.98	3/2,5/2,7/2	875.85	5/2$^-$			
776.07[@] *13*	3.9 *4*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1911.46	(1/2$^-$,3/2,5/2$^-$)			Placed by 1977Bi01 from 1912 level, but Eγ too low for that placement.
782.83 *15*	3.2 *4*	2091.35		1308.56	(1/2$^-$,3/2,5/2$^-$)			
785.4 *4*	1.1 *3*	2093.25		1308.56	(1/2$^-$,3/2,5/2$^-$)			
788.68[#] *8*	11.3[#] *7*	2575.04	(3/2$^+$)	1786.47	(1/2$^-$,3/2,5/2$^-$)			
791.10 *14*	3.8 *4*	2091.35		1300.521	(3/2$^+$,5/2$^-$)			
795.29 *12*	3.4 *3*	2886.52	(3/2,5/2$^-$)	2091.35				
^{x}831.3 *5*	0.7 *3*							
834.89[#] *5*	24.6[#] *13*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1852.67				
^{x}837.85 *19*	1.73 *24*							
858.47[#] *7*	10.7[#] *7*	2769.99	(3/2$^+$)	1911.46	(1/2$^-$,3/2,5/2$^-$)			
875.73[#] *6*	360[#] *20*	875.85	5/2$^-$	0.0	1/2$^-$			%Iγ=24.4 *14* assuming recommended decay scheme normalization.

From ENSDF

γ(^{93}Y) (continued)

E_γ[‡]	I_γ[‡b]	E_i(level)	J_i^π	E_f	J_f^π	Comments
888.13[#] *5*	325[#] *17*	1646.98	3/2,5/2,7/2	758.719	(9/2)$^+$	
900.98[#] *7*	10.2[#] *6*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1786.47	(1/2$^-$,3/2,5/2$^-$)	
910.18[&] *8*	12.1 *7*	1786.47	(1/2$^-$,3/2,5/2$^-$)	875.85	5/2$^-$	
922.70 *11*	4.9 *4*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	1646.98	3/2,5/2,7/2	
927.69[&] *8*	9.4 *7*	2575.04	(3/2$^+$)	1646.98	3/2,5/2,7/2	
930.91 *10*	6.0 *5*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	1852.67		
952.58 *23*	1.6 *3*	1542.73	(1/2,3/2,5/2$^-$)	590.219	(3/2)$^-$	
991.59 *21*	1.8 *3*	2778.06		1786.47	(1/2$^-$,3/2,5/2$^-$)	
1032.4 *5*	1.5 *5*	2575.04	(3/2$^+$)	1542.73	(1/2,3/2,5/2$^-$)	
1035.5 *3*	3.0 *5*	1911.46	(1/2$^-$,3/2,5/2$^-$)	875.85	5/2$^-$	
1040.63[#] *6*	47[#] *3*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1646.98	3/2,5/2,7/2	
1046.4[d] *5*	1.4 *4*	3824.5?		2778.06		Eγ similar to that required for a 2356 to 1309 transition.
1050.6[d] *3*	0.50 *21*	3871.31?		2820.65	(3/2$^+$)	
1055.13[#] *11*	5.1[#] *4*	2355.58	(3/2,5/2$^-$)	1300.521	(3/2$^+$,5/2$^-$)	
1064.37 *9*	5.5 *4*	2364.88	(3/2,5/2$^-$)	1300.521	(3/2$^+$,5/2$^-$)	
1077.86 *16*	3.5 *4*	2355.58	(3/2,5/2$^-$)	1277.94	(1/2$^-$,3/2,5/2$^-$)	
1094.00[#] *7*	25.9[#] *15*	1852.67		758.719	(9/2)$^+$	
1104.69[&] *23*	2.2 *4*	1695.91	(1/2$^-$,3/2,5/2)	590.219	(3/2)$^-$	
1117.1[d] *7*	1.0 *4*	3894.9?		2778.06		
1122.48[#&] *6*	59[#] *3*	2769.99	(3/2$^+$)	1646.98	3/2,5/2,7/2	
1136.77 *20*	2.9 *3*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	1646.98	3/2,5/2,7/2	
1180.76 *17*	3.6 *4*	2056.57	(1/2$^-$,3/2,5/2$^-$)	875.85	5/2$^-$	
1196.23[#] *6*	14.4[#] *8*	1786.47	(1/2$^-$,3/2,5/2$^-$)	590.219	(3/2)$^-$	
[x]1200.5 *7*	0.38 *17*					
1215.48[#] *7*	36.7[#] *20*	2091.35		875.85	5/2$^-$	1974Ac04 report Eγ=1214.4 *4* (Iγ=23 *10*) and Eγ=1216.7 *4* (Iγ=12 *6*).
1239.15 *25*	1.8 *4*	2886.52	(3/2,5/2$^-$)	1646.98	3/2,5/2,7/2	
1243.41[#] *8*	11.8[#] *7*	2543.93	3/2$^-$	1300.521	(3/2$^+$,5/2$^-$)	
1249.2[d] *7*	1.1 *4*	3824.5?		2575.04	(3/2$^+$)	
1261.3 *6*	1.2 *5*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	1308.56	(1/2$^-$,3/2,5/2$^-$)	
1266.38 *10*	16.4 *12*	2575.04	(3/2$^+$)	1308.56	(1/2$^-$,3/2,5/2$^-$)	
1269.47[#] *7*	105[#] *5*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	1300.521	(3/2$^+$,5/2$^-$)	
1277.99[#] *9*	12.8[#] *9*	1277.94	(1/2$^-$,3/2,5/2$^-$)	0.0	1/2$^-$	
1308.60[#] *9*	5.9[#] *4*	1308.56	(1/2$^-$,3/2,5/2$^-$)	0.0	1/2$^-$	
1321.24[#] *7*	38.4[#] *20*	1911.46	(1/2$^-$,3/2,5/2$^-$)	590.219	(3/2)$^-$	
1324.8[d] *7*	0.8 *3*	3894.9?		2569.95	3/2$^+$,5/2$^+$,7/2$^+$	
1329.6 *3*	1.01 *20*	3116.05	(3/2,5/2$^-$)	1786.47	(1/2$^-$,3/2,5/2$^-$)	
1332.5 *5*	7 *4*	2091.35		758.719	(9/2)$^+$	
1334.50[#] *10*	10.0[#] *7*	2093.25		758.719	(9/2)$^+$	

$\gamma(^{93}$Y) (continued)

E_γ [‡]	I_γ [‡b]	E_i(level)	J_i^π	E_f	J_f^π
1378.98 *10*	5.2 *4*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1308.56	(1/2$^-$,3/2,5/2$^-$)
1387.11[#] *7*	51[#] *3*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1300.521	(3/2$^+$,5/2$^-$)
1434.01[#] *8*	13.3[#] *8*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	1135.99	(3/2$^+$,5/2$^-$)
1438.93[#] *9*	7.4[#] *5*	2575.04	(3/2$^+$)	1135.99	(3/2$^+$,5/2$^-$)
1466.2 *3*	1.5 *3*	2056.57	(1/2$^-$,3/2,5/2$^-$)	590.219	(3/2)$^-$
1469.50[#] *12*	7.7[#] *5*	2769.99	(3/2$^+$)	1300.521	(3/2$^+$,5/2$^-$)
1483.3 *3*	1.5 *3*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	1300.521	(3/2$^+$,5/2$^-$)
1492.13[#] *12*	8.1[#] *5*	2769.99	(3/2$^+$)	1277.94	(1/2$^-$,3/2,5/2$^-$)
1506.5[d] *6*	0.71 *23*	3871.31?		2364.88	(3/2,5/2$^-$)
1511.8 *4*	0.81 *20*	2820.65	(3/2$^+$)	1308.56	(1/2$^-$,3/2,5/2$^-$)
1520.1 *5*	4.7 *10*	2820.65	(3/2$^+$)	1300.521	(3/2$^+$,5/2$^-$)
1538.71 *25*	1.5 *3*	2129.11	(1/2$^-$,3/2,5/2$^-$)	590.219	(3/2)$^-$
1543.4 *6*	0.60 *22*	1542.73	(1/2,3/2,5/2$^-$)	0.0	1/2$^-$
1551.59[#] *9*	15.0[#] *9*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	1135.99	(3/2$^+$,5/2$^-$)
[x]1609.77 *20*	2.9 *3*				
1634.05[#] *8*	21.3[#] *12*	2769.99	(3/2$^+$)	1135.99	(3/2$^+$,5/2$^-$)
1642.0 *6*	0.64 *21*	2778.06		1135.99	(3/2$^+$,5/2$^-$)
1647.53[#] *8*	13.1[#] *8*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	1135.99	(3/2$^+$,5/2$^-$)
[x]1652.2 *7*	0.52 *20*				
1668.7 *5*	2.4 *13*	2543.93	3/2$^-$	875.85	5/2$^-$
1684.84[#] *13*	10.5[#] *8*	2820.65	(3/2$^+$)	1135.99	(3/2$^+$,5/2$^-$)
1694.07[#] *9*	38.0[#] *21*	2569.95	3/2$^+$,5/2$^+$,7/2$^+$	875.85	5/2$^-$
1699.06[#] *9*	49[#] *3*	2575.04	(3/2$^+$)	875.85	5/2$^-$
1706.59[#] *10*	16.3[#] *10*	3007.05	(3/2,5/2$^-$)	1300.521	(3/2$^+$,5/2$^-$)
1742.1[d] *4*	1.28 *23*	3871.31?		2129.11	(1/2$^-$,3/2,5/2$^-$)
1765.36[#] *9*	15.7[#] *8*	2355.58	(3/2,5/2$^-$)	590.219	(3/2)$^-$
1774.83[#] *16*	2.4[#] *3*	2364.88	(3/2,5/2$^-$)	590.219	(3/2)$^-$
1786.6[@] *3*	1.16 *18*	1786.47	(1/2$^-$,3/2,5/2$^-$)	0.0	1/2$^-$
1811.45[#] *10*	20.7[#] *12*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	875.85	5/2$^-$
1816.12[#] *19*	3.4[#] *4*	2575.04	(3/2$^+$)	758.719	(9/2)$^+$
1894.1 *3*	1.8 *3*	2769.99	(3/2$^+$)	875.85	5/2$^-$
[x]1899.5 *10*	0.52 *19*				
1907.73 *23*	2.6 *3*	2783.54	3/2$^{(+)}$ to 7/2$^{(+)}$	875.85	5/2$^-$
1928.79[#] *10*	17.2[#] *10*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	758.719	(9/2)$^+$
[x]1935.6 *7*	0.50 *17*				
1944.75[#] *12*	8.2[#] *6*	2820.65	(3/2$^+$)	875.85	5/2$^-$
[x]1952.4 *3*	1.46 *25*				
1972.2[d] *7*	0.49 *18*	3824.5?		1852.67	

$^{93}_{39}$Y$_{54}$-8

γ(^{93}Y) (continued)

E_γ[‡]	I_γ[‡b]	E_i(level)	J^π_i	E_f	J^π_f
[x]1978.2 *9*	0.39 *18*				
1981.4 *8*	0.54 *20*	3116.05	(3/2,5/2$^-$)	1135.99	(3/2$^+$,5/2$^-$)
1984.8 *3*	1.20 *19*	2575.04	(3/2$^+$)	590.219	(3/2)$^-$
2010.80[#] *25*	1.79[#] *25*	2886.52	(3/2,5/2$^-$)	875.85	5/2$^-$
[x]2054.68 *25*	2.0 *3*				
2063.64[#] *12*	9.2[#] *6*	2653.91	(1/2,3/2,5/2)	590.219	(3/2)$^-$
[x]2076.6 *7*	0.88 *24*				
[x]2094.1 *6*	1.1 *3*				
[x]2104.78[#] *15*	4.6[#] *4*				
2108.6[d] *4*	1.30 *23*	3894.9?		1786.47	(1/2$^-$,3/2,5/2$^-$)
2129.2 *5*	1.5 *5*	2129.11	(1/2$^-$,3/2,5/2$^-$)	0.0	1/2$^-$
[x]2172.0 *4*	1.05 *19*				
2179.49[#] *20*	4.3[#] *6*	2769.99	(3/2$^+$)	590.219	(3/2)$^-$
[x]2203.5 *7*	1.3 *3*				
[x]2222.0 *8*	0.6 *3*				
2230.27[#] *12*	22.8[#] *13*	2820.65	(3/2$^+$)	590.219	(3/2)$^-$
2296.13[#] *14*	10.9[#] *7*	2886.52	(3/2,5/2$^-$)	590.219	(3/2)$^-$
2364.72[#] *11*	23.2[#] *13*	2364.88	(3/2,5/2$^-$)	0.0	1/2$^-$
2416.3 *3*	1.6 *3*	3007.05	(3/2,5/2$^-$)	590.219	(3/2)$^-$
[x]2472.7 *3*	1.12 *15*				
2543.84[#] *11*	44.5[#] *24*	2543.93	3/2$^-$	0.0	1/2$^-$
2574.2 *3*	1.9 *3*	2575.04	(3/2$^+$)	0.0	1/2$^-$
2585.9[d] *6*	0.40 *12*	3894.9?		1308.56	(1/2$^-$,3/2,5/2$^-$)
[x]2614.7 *3*	1.32 *17*				
2688.65[#ad] *12*	31.3[#] *18*	2687.55	3/2$^+$,5/2$^+$,7/2$^+$	0.0	1/2$^-$
[x]2765.3 *6*	0.61 *20*				
[x]2781.6 *4*	0.76 *11*				
[x]2811.3 *7*	0.31 *7*				
[x]2828.54[#] *20*	2.52[#] *25*				
[x]2983.5 *4*	0.66 *21*				
[x]2985.72 *21*	2.9 *4*				
2995.7[d] *6*	0.29 *7*	3871.31?		875.85	5/2$^-$
3006.86[#] *22*	1.73[#] *17*	3007.05	(3/2,5/2$^-$)	0.0	1/2$^-$
3116.6[#] *4*	1.02[#] *13*	3116.05	(3/2,5/2$^-$)	0.0	1/2$^-$

[†] From α(K)exp.

[‡] From 1977Bi01, except as noted. In general, data from 1974Ac04 and 1972He41 agree well with those from 1977Bi01.

$^{93}_{39}$Y$_{54}$-9

γ(^{93}Y) (continued)

[#] Also observed in studies other than that of 1977Bi01.

[@] Placed by evaluator based on level energy difference. 1977Bi01 either left γ unplaced or placed it such that Eγ was 4σ from least-squares adjusted level energy difference.

[&] Differs by 3σ or 4σ from least-squares adjusted level energy difference.

[a] Placed by 1977Bi01 from 2688 level, but Eγ is 5σ from least-squares adjusted value. Eγ is correct for placement from 3825 level of 1977Bi01, but such a placement would imply Iβ(1136 level)=0.5 *5* (cf. 2.6 *5* based on authors′ placement of 2688γ, and 1.9 from TAGS data (1997Gr09)); more importantly, the TAGS data of 1997Gr09 question the existence of a 3825 level and definitely rule out such strong β feeding to it as the level scheme of 1977Bi01 implies. Since 1978St02 report 2875β^-260γ coin (further supporting β feeding of the 1136 level) and no γ-2688γ coin is observed (1977Bi01, 1974Ac04), the evaluator tentatively adopts the placement proposed in 1977Bi01. However, the 2688γ may well be a doublet. The other component could feed the long-lived 759 level, consistent both with the absence of γ-2688γ coin and with the β^- branching implied by TAGS data (1997Gr09) for the 759, 2688 levels and in the vicinity of 3400 keV *100*; unfortunately, no other transition(s) from the implied 3447 level can be identified. Alternatively, a close doublet of 2688 levels could exist.

[b] For absolute intensity per 100 decays, multiply by 0.068 *3*.

[c] 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.

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

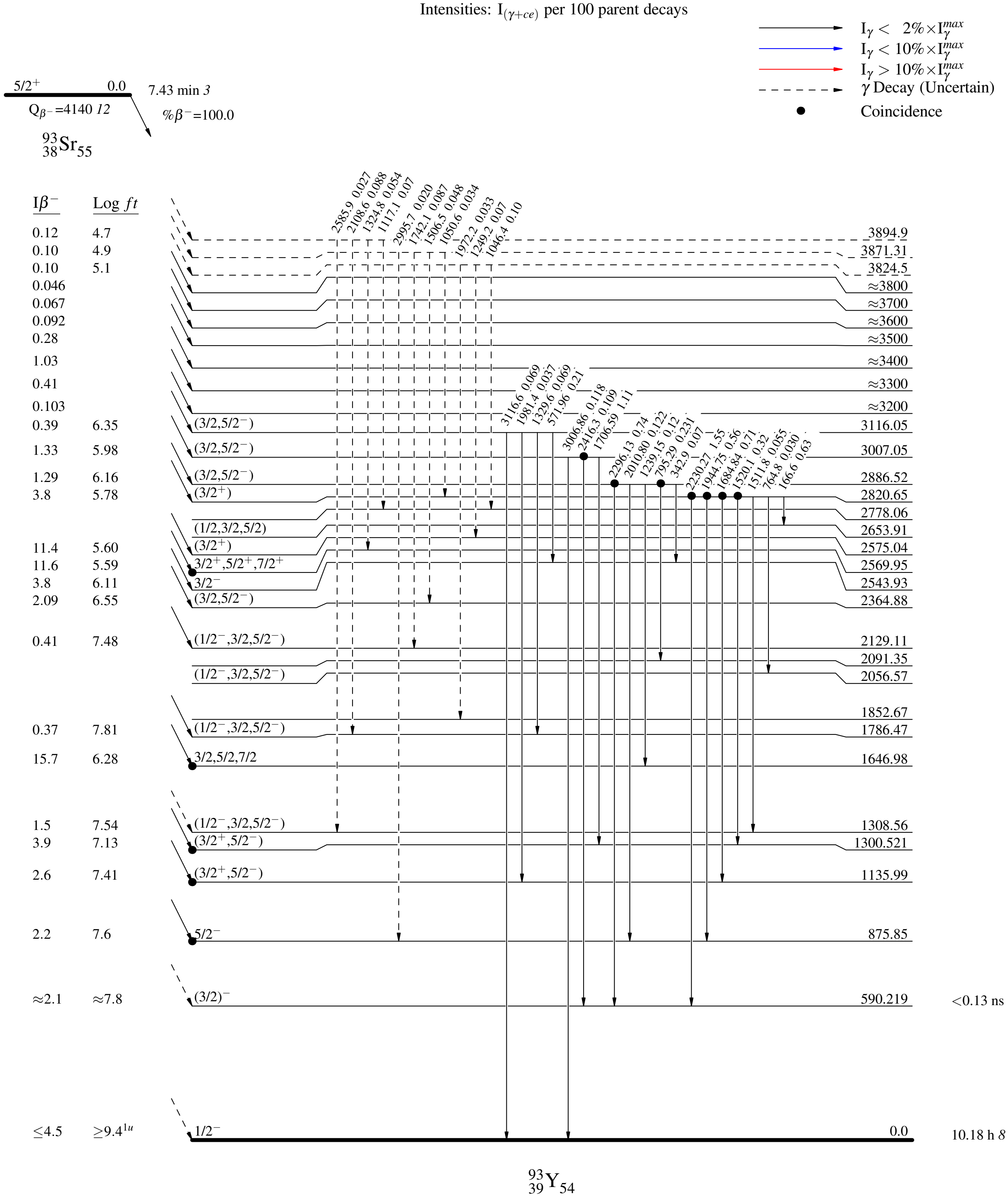
[x] γ ray not placed in level scheme.

^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41

Decay Scheme

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

Legend

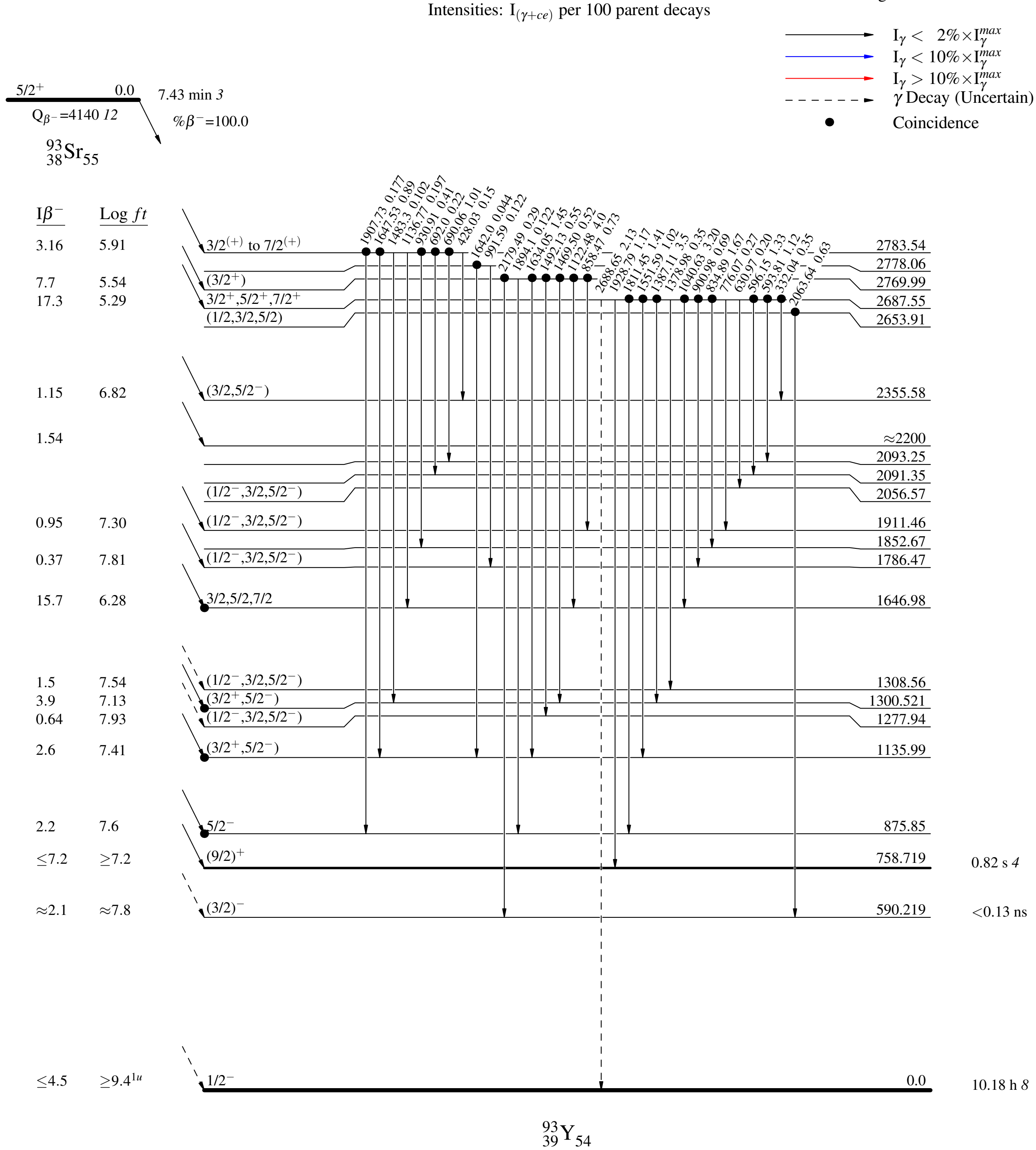


$^{93}Sr\ \beta^-$ decay 1977Bi01,1974Ac04,1972He41

Decay Scheme (continued)

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

Legend

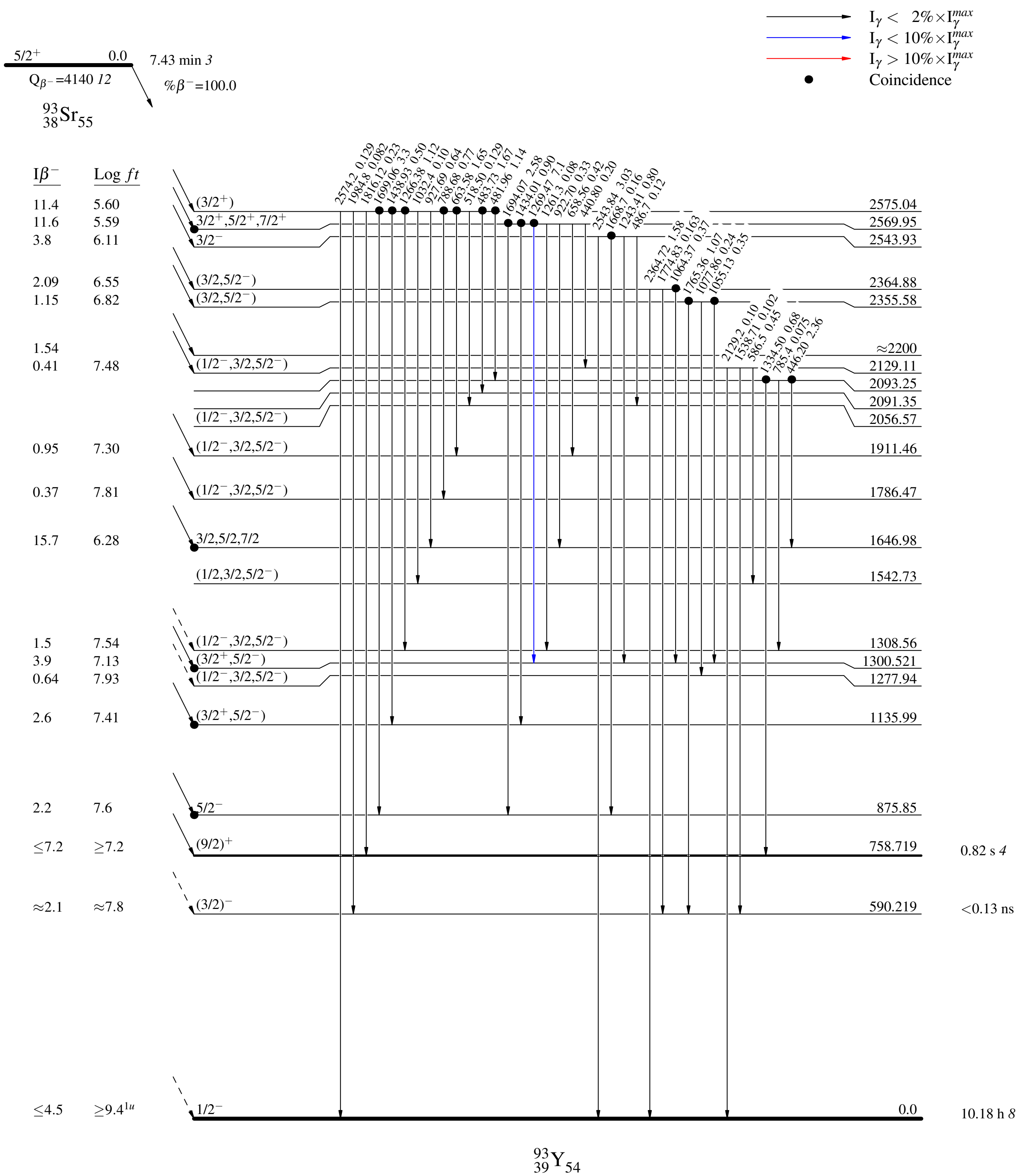


^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41

Decay Scheme (continued)

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

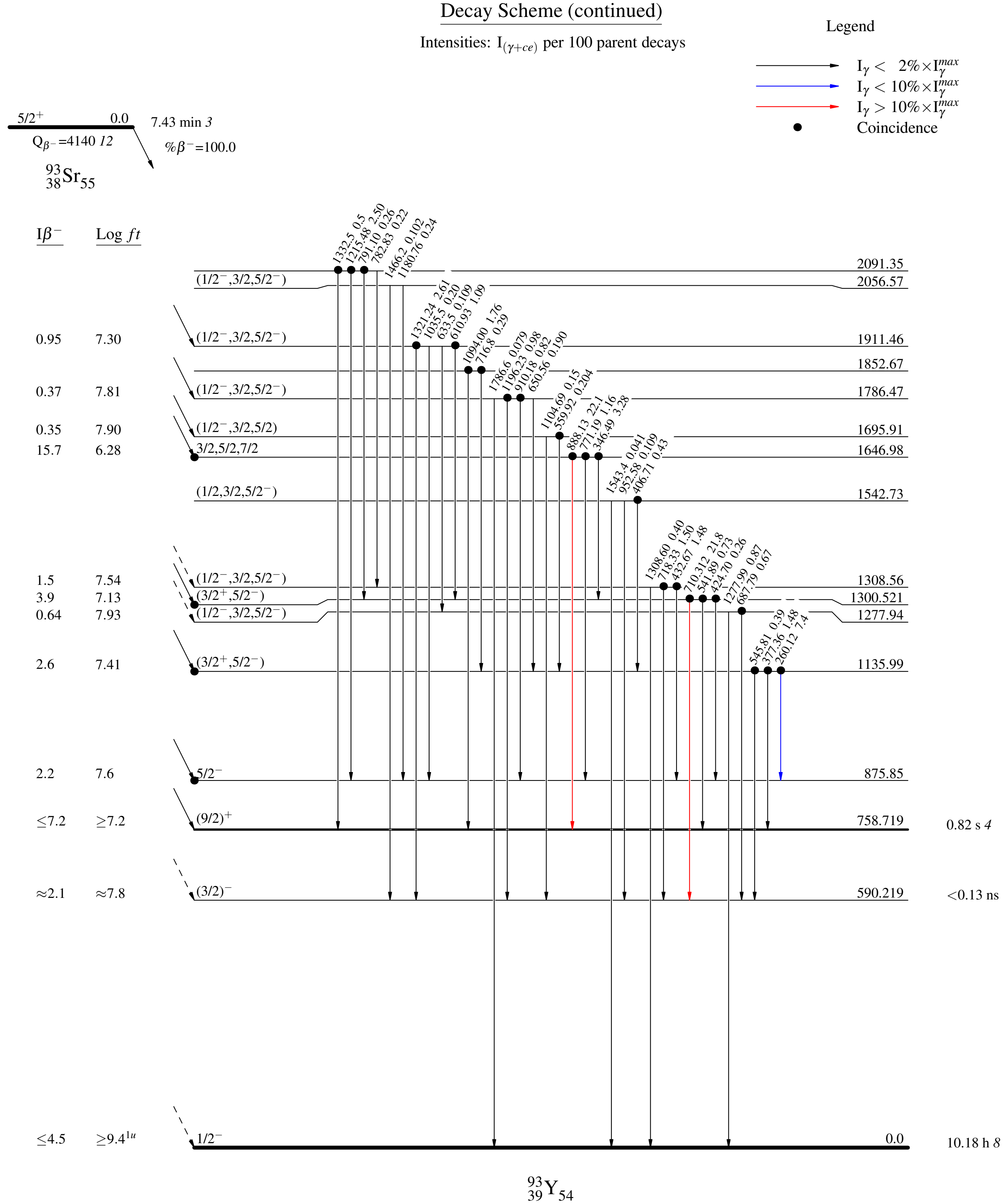
Legend



^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41

Decay Scheme (continued)

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



^{93}Sr β^- decay 1977Bi01,1974Ac04,1972He41

Decay Scheme (continued)

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