^{147}Cs β^- decay 2005Sy01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	N. Nica and B. Singh	NDS 181, 1 (2022)	9-Mar-2022

Parent: ^{147}Cs: E=0.0; J$^\pi$=(3/2$^+$); $T_{1/2}$=0.2295 s *10*; Q(β^-)=8344 *21*; %β^- decay=100.0
^{147}Cs-J$^\pi$,$T_{1/2}$: from ^{147}Cs Adopted Levels.
^{147}Cs-Q(β^-): From 2021Wa16.
2005Sy01:
^{147}Cs produced via thermal neutron-induced fission of ^{235}U target integrated in an ion source. Fission product mass separator OSIRIS. Measured Eγ, Iγ, $\gamma\gamma$, γ-x coin, $\beta\gamma$(t) coin, lifetimes with a three-detector system that included a low-energy photon and X-ray (LOAX) detector and two HPGe detectors. $\beta\gamma$(t) coin measurements involved two fast-response scintillators, a thin NE111A plastic for β particle detection, and a small BaF_2 crystal as well as a HPGe detector for γ rays.
Others: 1981ScZM, 1981ShZH, 1987ScZG.
The level scheme is from 2005Sy01 and is incomplete. 2005Sy01 compare their results to 1981ScZM and find discrepancies (see comments below).

^{147}Ba Levels

E(level)†	J$^\pi$‡	$T_{1/2}$#	Comments
0.0	(5/2$^-$)	0.894 s *7*	$T_{1/2}$: adopted value.
46.23 *5*	(3/2$^-$,5/2$^-$)	0.51 ns *8*	$T_{1/2}$: 1.4 ns in 1981ScZM.
74.9?@ *8*			
85.39 *5*	(5/2$^-$)	0.37 ns *10*	$T_{1/2}$: 2.1 ns in 1981ScZM.
109.81 *5*	(7/2$^-$)	1.4 ns	$T_{1/2}$: from 1981ScZM.
185.81 *6*	(7/2$^-$)		
198.9?@ *8*			
238.80 *7*	(9/2$^-$)		
279.18 *9*	(9/2$^-$)		
292.10 *6*	($^-$)	0.3 ns	$T_{1/2}$: from 1981ScZM.
319.4?@ *8*			
327.40 *6*			
359.96 *12*	(9/2$^+$)		
365.62 *8*	($^-$)		
397.48 *7*	($^-$)		
426.10 *7*			
451.32 *7*			
462.08 *7*			
487.0?@ *8*			
491.12 *8*			
513.81 *7*	($^-$)		
544.16 *8*			
564.36 *7*			
587.00 *8*			
595.72 *9*			
628.34 *11*			
642.31 *14*	($^-$)		
655.64 *18*			
705.70 *15*			
716.31 *10*			
719.80 *8*			
738.16 *16*			
744.45 *9*			
773.61 *15*			
787.11 *10*			
801.70 *10*			

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^{147}Cs β^- decay 2005Sy01 (continued)

^{147}Ba Levels (continued)

E(level)[†]	E(level)[†]	E(level)[†]
921.26 *11*	1078.9 *3*	1262.00 *17*
930.51 *21*	1090.3 *3*	1326.21 *21*
1015.94 *8*	1208.96 *18*	1707.2 *3*
1045.60 *10*	1239.53 *17*	2300.2 *8*
		2365.2 *10*

[†] From least-squares fit to Eγ′s by evaluator.
[‡] From Adopted Levels.
[#] From 2005Sy01, except where noted. Lifetime measurements from 2005Sy01 were made using Advanced Time-Delayed (ATD) βγγ(t) method. The values were obtained in least-square fitting procedure of the whole spectrum to a response function which was constructed by a convolution of the Gaussian prompt and an exponential decay curve.
[@] Observed in 1981ScZM but not in 2005Sy01.

γ(^{147}Ba)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[d]	Comments
24.4 *1*	0.7[c] *4*	109.81	(7/2⁻)	85.39	(5/2⁻)			I_γ: Iγ=0.2 *1* in 1981ScZM.
28.9[@e]	3.5 *17*	74.9?		46.23	(3/2⁻,5/2⁻)			
35.1[@e]	3.5 *17*	109.81	(7/2⁻)	74.9?				
35.2 *2*	1.2[b] *4*	327.40		292.10	(⁻)			
39.2 *1*	3.7[b] *4*	85.39	(5/2⁻)	46.23	(3/2⁻,5/2⁻)	M1(+E2)	40 *26*	α(K)=10.1 *25*; α(L)=24 *22*; α(M)=5.2 *49* α(N)=1.1 *10*; α(O)=0.14 *13*; α(P)=6.7×10^{-4} *18* I_γ: % branching=1.2; Iγ deduced assuming 85.4 transition is M1. Mult.: M1 from 2005Sy01 based on RUL (that excludes ΔJ ≥ 2) and Δπ=no (that excludes E1); 2005Sy01 do not exclude a very small E2 admixture. α: for pure M1.
46.2 *1*	32[a] *5*	46.23	(3/2⁻,5/2⁻)	0.0	(5/2⁻)	M1(+E2)	21 *13*	α(K)=7.74 *17*; α(L)=10.8 *97*; α(M)=2.4 *22* α(N)=0.49 *45*; α(O)=0.063 *56*; α(P)=0.00045 *8* I_γ: % branching=9.6; Iγ=45 *4* in 1981ScZM. α(K)exp: 7.2 *8* (2005Sy01) deduced from sum of coincidence spectra gated by the 541, 582, 674, 741 and 1193 transitions. Mult.: α(K)exp gives M1, E2 or M1+E2; however, pure E2 is excluded from RUL, although very small E2 admixture is possible. This excludes E1 from 1981ScZM. α: for pure M1.
63.6[@e]	3.5 *17*	109.81	(7/2⁻)	46.23	(3/2⁻,5/2⁻)			
75.1[@e]		74.9?		0.0	(5/2⁻)			
76.0 *1*	12.1[a] *17*	185.81	(7/2⁻)	109.81	(7/2⁻)			

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^{147}Cs β^- decay 2005Sy01 (continued)

$\gamma(^{147}Ba)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[d]	Comments
85.4 *1*	100[a] *5*	85.39	(5/2⁻)	0.0	(5/2⁻)	M1(+E2)	2.47 *92*	α(K)=1.6 *3*; α(L)=0.66 *49*; α(M)=0.14 *11* α(N)=0.030 *22*; α(O)=0.0040 *28*; α(P)=8.71×10^{-5} *13* I_γ: %γ-branching=31.4; deduced assuming mult(39.2γ)=M1. Mult.: M1 from 1981ScZM based on K/L ratio; 2005Sy01 exclude E2 based on RUL, but do not exclude a very small E2 admixture. α: for pure M1.
93.0[@e]	10 *5*	292.10	(⁻)	198.9?				Mult.: E2 from K/L ratios from 1981ScZM; however, γ not listed by 2005Sy01 (possible contamination from ^{147}La), so mult not adopted here.
100.4 *1*	3.7[b] *8*	185.81	(7/2⁻)	85.39	(5/2⁻)			
109.8 *1*	82.6[a] *19*	109.81	(7/2⁻)	0.0	(5/2⁻)	M1+E2	1.07 *32*	α(K)=0.78 *14*; α(L)=0.23 *15*; α(M)=0.049 *32* α(N)=0.0103 *65*; α(O)=0.00142 *83*; α(P)=4.27×10^{-5} *6* I_γ: Iγ=18 *2* in 1981ScZM. Mult.: M1 reported in 1981ScZM but I(γ+ce) reported in that paper was calculated with α for E2. K/L ratio in 1987ScZG agrees with E2+M1.
116.4 *1*	2.0[a] *4*	513.81	(⁻)	397.48	(⁻)			
123.9 *1*	2.1[a] *4*	451.32		327.40				
129.0 *1*	3.4[c] *9*	238.80	(9/2⁻)	109.81	(7/2⁻)	D		
134.6 *1*	3.0[b] *8*	462.08		327.40				
139.6 *1*	3.1[b] *7*	185.81	(7/2⁻)	46.23	(3/2⁻,5/2⁻)			
140.5[@e]	31 *17*	327.40		185.81	(7/2⁻)			Mult.: M1 from 1981ScZM, E2 from 1987ScZG (both from K/L ratios); however, γ not listed by 2005Sy01 (possible contamination from ^{147}La) so mult not adopted here.
153.4 *1*	2.6[c] *4*	238.80	(9/2⁻)	85.39	(5/2⁻)	E2	0.428	α(K)=0.315 *5*; α(L)=0.0892 *13*; α(M)=0.0192 *3* α(N)=0.00402 *6*; α(O)=0.000549 *8*; α(P)=1.584×10^{-5} *23*
169.4 *1*	6.8[c] *18*	279.18	(9/2⁻)	109.81	(7/2⁻)	M1+E2	0.26 *4*	α(K)=0.211 *19*; α(L)=0.043 *17*; α(M)=0.0090 *38* α(N)=0.00191 *77*; α(O)=2.71×10^{-4} *97*; α(P)=1.22×10^{-5} *5*
174.1 *2*	5.1[b] *9*	359.96	(9/2⁺)	185.81	(7/2⁻)	D		
179.9 *2*	2.9[b] *8*	365.62	(⁻)	185.81	(7/2⁻)			
180.1 *2*	7.2[a] *7*	642.31	(⁻)	462.08				
184.1 *2*	0.7[b] *2*	544.16		359.96	(9/2⁺)			
185.8 *1*	36.7[c] *12*	185.81	(7/2⁻)	0.0	(5/2⁻)	M1,E2	0.198 *24*	α(K)=0.160 *11*; α(L)=0.030 *11*; α(M)=0.0064 *24* α(N)=0.00136 *48*; α(O)=1.95×10^{-4} *60*; α(P)=9.3×10^{-6} *6* Mult.: from K/L ratio in 1981ScZM.

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^{147}Cs β^- decay 2005Sy01 (continued)

γ(^{147}Ba) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[d]	Comments
186.4 *1*	13.0[a] *21*	513.81	(−)	327.40				
198.9[@e]	38.0 *7*	198.9?		0.0	(5/2−)			α(K)= 0.0293; α(L)=0.00380; α(M)=0.00077; α(N+..)=0.00021 Mult.: from K/L ratio, E1 from 1981ScZM but M1,E2 from 1987ScZG; since 2005Sy01 do not list this relatively intense γ (because of possible contamination from ^{147}La), no mult is adopted here.
204.4 *2*	1.0[a] *2*	564.36		359.96	(9/2+)			
216.8 *1*	2.5[c] *2*	544.16		327.40				
221.7 *1*	11.1[a] *18*	513.81	(−)	292.10	(−)			
238.8 *1*	3.9[c] *6*	238.80	(9/2−)	0.0	(5/2−)	(E2)	0.0949	α(K)=0.0755 *11*; α(L)=0.01542 *22*; α(M)=0.00328 *5* α(N)=0.000691 *10*; α(O)=9.77×10^{-5} *14*; α(P)=4.13×10^{-6} *6*
241.9 *2*	12.3[b] *12*	327.40		85.39	(5/2−)			
245.9 *1*	86[a] *6*	292.10	(−)	46.23	(3/2−,5/2−)	M1+E2	0.0841 *24*	α(K)=0.0695 *13*; α(L)=0.0115 *23*; α(M)=0.0024 *6* α(N)=0.00052 *11*; α(O)=7.5×10^{-5} *13*; α(P)=4.2×10^{-6} *5* α(exp): 0.08 *2* from intensity balances (2005Sy01). Mult.: M1+E2 from 1981ScZM; M1, E2, or M1+E2 2005Sy01, α(exp); E1 from 1987ScZG (1981ScZM and 1987ScZG from K/L ratios).
250.1 *3*	7.7[b] *20*	359.96	(9/2+)	109.81	(7/2−)	D		
255.8 *1*	1.8[c] *5*	365.62	(−)	109.81	(7/2−)			
265.0 *1*	8.7[a] *17*	544.16		279.18	(9/2−)			
265.6 *2*	7.0[c] *14*	451.32		185.81	(7/2−)			
276.1[@e]	4 *2*	595.72		319.4?				
280.2 *2*	6.5[b] *8*	365.62	(−)	85.39	(5/2−)	M1,E2[&]	0.0571 *12*	α(K)=0.0476 *23*; α(L)=0.0075 *10*; α(M)=0.00157 *23* α(N)=0.00034 *5*; α(O)=5.0×10^{-5} *5*; α(P)=2.9×10^{-6} *4*
281.2 *1*	19.5[c] *24*	327.40		46.23	(3/2−,5/2−)			
292.0[@e]	17 *9*	292.10	(−)	0.0	(5/2−)			
293.1 *1*	1.7[b] *8*	744.45		451.32				
294.7 *3*	1.4[c] *4*	587.00		292.10	(−)			
303.6 *2*	1.3[c] *4*	595.72		292.10	(−)			
305.4 *2*	16.8[b] *9*	491.12		185.81	(7/2−)			
312.2 *1*	31[a] *3*	397.48	(−)	85.39	(5/2−)			
316.3 *2*	6.5[a] *21*	426.10		109.81	(7/2−)			
319.3[@e]	28 *14*	319.4?		0.0	(5/2−)			E_γ: possible contaminant from ^{147}La in 1981ScZM.
319.4 *1*	25.9[b] *15*	365.62	(−)	46.23	(3/2−,5/2−)			2005Sy01 confirm the tentative placement of 1981ScZM.
325.6 *3*	7.8[a] *8*	564.36		238.80	(9/2−)			
327.4 *2*	51[b] *10*	327.40		0.0	(5/2−)			2005Sy01 confirm the tentative placement of 1981ScZM.
327.8 *2*	4.3[b] *12*	513.81	(−)	185.81	(7/2−)	M1+E2[&]	0.0363 *23*	α(K)=0.031 *3*; α(L)=0.0046 *3*;

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^{147}Cs β^- decay 2005Sy01 (continued)

$\gamma(^{147}$Ba) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[d]	Comments
								α(M)=0.00096 8 α(N)=0.000205 14; α(O)=3.05×10^{-5} 12; α(P)=1.9×10^{-6} 3
336.3 3	0.7[b] 5	628.34		292.10	($^-$)			
340.7 1	8.1[b] 3	426.10		85.39	(5/2$^-$)			
341.5 2	5.1[c] 10	451.32		109.81	(7/2$^-$)			I_γ: Iγ=17 9 in 1981ScZM.
350.3 2	7.3[b] 8	642.31	($^-$)	292.10	($^-$)	M1+E2[&]	0.0301 24	α(K)=0.0254 25; α(L)=0.00376 15; α(M)=0.00078 4 α(N)=0.000167 7; α(O)=2.50×10^{-5} 5; α(P)=1.57×10^{-6} 25
351.2 1	64[a] 3	397.48	($^-$)	46.23	(3/2$^-$,5/2$^-$)	M1+E2[&]	0.0299 24	α(K)=0.0252 25; α(L)=0.00373 14; α(M)=0.00078 4 α(N)=0.000166 7; α(O)=2.48×10^{-5} 5; α(P)=1.56×10^{-6} 25
352.3 1	4.3[c] 11	462.08		109.81	(7/2$^-$)			
359.2[@e]	7	359.96	(9/2$^+$)	0.0	(5/2$^-$)			
365.6[@e]	35 4	365.62	($^-$)	0.0	(5/2$^-$)			
365.9 1	21.2[b] 15	451.32		85.39	(5/2$^-$)			
377.5[@e]	4 2	487.0?		109.81	(7/2$^-$)			
378.2 1	7.8[b] 8	738.16		359.96	(9/2$^+$)			
381.3 2	4.7[c] 10	491.12		109.81	(7/2$^-$)			
397.4 2	3.4[a] 9	397.48	($^-$)	0.0	(5/2$^-$)			
405.8 1	11.2[b] 10	491.12		85.39	(5/2$^-$)			
409.5[@e]	4 2	595.72		185.81	(7/2$^-$)			
424.3 2	1.4[b] 3	716.31		292.10	($^-$)			
426.1 1	7.3[a] 12	426.10		0.0	(5/2$^-$)			
434.3 1	8.1[b] 23	544.16		109.81	(7/2$^-$)			
444.8 1	18[c] 4	491.12		46.23	(3/2$^-$,5/2$^-$)			
452.4 1	5.8[b] 5	744.45		292.10	($^-$)			
454.6 2	1.9[b] 4	564.36		109.81	(7/2$^-$)			
459.7 1	5.6[c] 9	787.11		327.40				
462.1 1	42[a] 6	462.08		0.0	(5/2$^-$)			
469.8 3	5.4[a] 5	655.64		185.81	(7/2$^-$)			
479.0 1	6.9[c] 7	564.36		85.39	(5/2$^-$)			
486.8[@e]	5.0 25	487.0?		0.0	(5/2$^-$)			
501.5 5	4.9[b] 8	587.00		85.39	(5/2$^-$)			
519.9 2	4.7[c] 10	705.70		185.81	(7/2$^-$)			
540.8 1	21[c] 3	587.00		46.23	(3/2$^-$,5/2$^-$)			
545.8 3	3.5[b] 3	655.64		109.81	(7/2$^-$)			
549.2 2	7.2[c] 18	595.72		46.23	(3/2$^-$,5/2$^-$)			
557.0 3	5.3[b] 5	642.31	($^-$)	85.39	(5/2$^-$)			
564.3 1	5.4[a] 4	564.36		0.0	(5/2$^-$)			
570.3 3	4.0[b] 4	655.64		85.39	(5/2$^-$)			
582.1 1	19[c] 3	628.34		46.23	(3/2$^-$,5/2$^-$)			
587.0 1	14[a] 3	587.00		0.0	(5/2$^-$)			
593.9 1	4.0[c] 4	921.26		327.40				
595.8 1	13.6[a] 17	595.72		0.0	(5/2$^-$)			I_γ: Iγ=59 7 in 1981ScZM.
601.3 5	6.0[b] 21	787.11		185.81	(7/2$^-$)			
609.9 2	1.6[b] 4	719.80		109.81	(7/2$^-$)			

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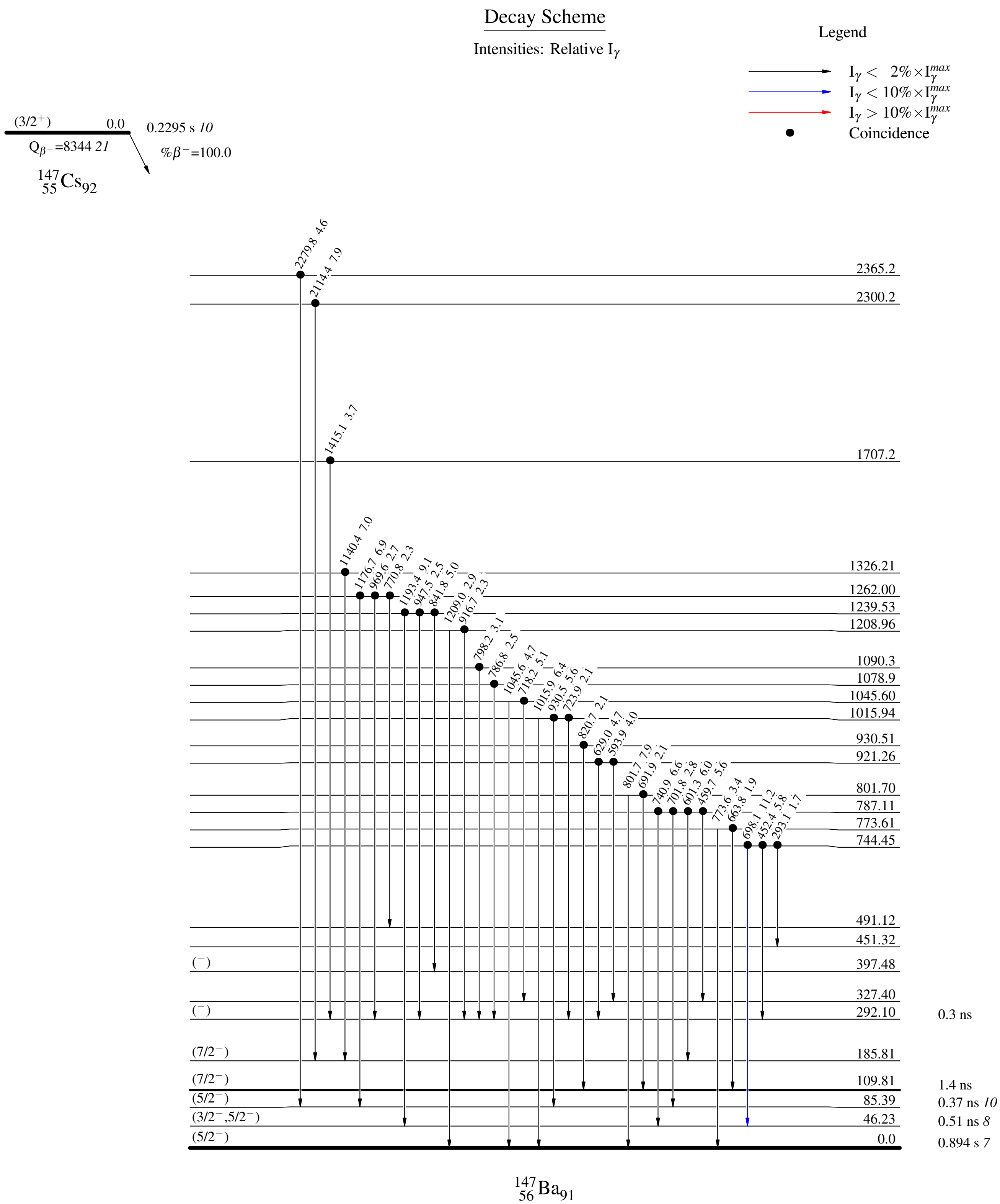
^{147}Cs β^- decay 2005Sy01 (continued)

γ(^{147}Ba) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f
620.3 *2*	3.0[c] *6*	705.70		85.39	(5/2$^-$)
629.0 *2*	4.7[c] *15*	921.26		292.10	($^-$)
630.9 *1*	8.4[c] *6*	716.31		85.39	(5/2$^-$)
634.4 *1*	5.5[b] *9*	719.80		85.39	(5/2$^-$)
663.8 *2*	1.9[b] *4*	773.61		109.81	(7/2$^-$)
673.6 *1*	3.3[c] *6*	719.80		46.23	(3/2$^-$,5/2$^-$)
691.9 *4*	2.1[b] *5*	801.70		109.81	(7/2$^-$)
698.1 *2*	11.2[b] *11*	744.45		46.23	(3/2$^-$,5/2$^-$)
701.8 *5*	2.8[b] *4*	787.11		85.39	(5/2$^-$)
718.2 *1*	5.1[a] *10*	1045.60		327.40	
723.9 *1*	2.1[c] *4*	1015.94		292.10	($^-$)
740.9 *2*	6.6[c] *5*	787.11		46.23	(3/2$^-$,5/2$^-$)
770.8 *4*	2.3[a] *4*	1262.00		491.12	
773.6 *2*	3.4[a] *7*	773.61		0.0	(5/2$^-$)
786.8 *3*	2.5[c] *12*	1078.9		292.10	($^-$)
798.2 *3*	3.1[c] *10*	1090.3		292.10	($^-$)
801.7 *1*	7.9[a] *17*	801.70		0.0	(5/2$^-$)
820.7 *2*	2.1[b] *6*	930.51		109.81	(7/2$^-$)
841.8 *3*	5.0[c] *5*	1239.53		397.48	($^-$)
916.7 *4*	2.3[b] *4*	1208.96		292.10	($^-$)
930.5 *1*	5.6[c] *17*	1015.94		85.39	(5/2$^-$)
947.5 *5*	2.5[c] *5*	1239.53		292.10	($^-$)
969.6 *4*	2.7[b] *6*	1262.00		292.10	($^-$)
1015.9 *3*	6.4[a] *12*	1015.94		0.0	(5/2$^-$)
1045.6 *2*	4.7[a] *11*	1045.60		0.0	(5/2$^-$)
1140.4 *2*	7.0[c] *5*	1326.21		185.81	(7/2$^-$)
1176.7 *2*	6.9[c] *13*	1262.00		85.39	(5/2$^-$)
1193.4 *2*	9.1[c] *14*	1239.53		46.23	(3/2$^-$,5/2$^-$)
1209.0 *2*	2.9[a] *8*	1208.96		0.0	(5/2$^-$)
1415.1 *3*	3.7[c] *5*	1707.2		292.10	($^-$)
2114.4 *8*	7.9[b] *17*	2300.2		185.81	(7/2$^-$)
2279.8 *10*	4.6[b] *10*	2365.2		85.39	(5/2$^-$)

[†] From 2005Sy01, except where noted.
[‡] Relative intensities from 2005Sy01.
[#] From Adopted Levels, Gammas dataset.
[@] Observed in 1981ScZM but not in 2005Sy01.
[&] From 1981ScZM and 1987ScZG based on K/L ratios.
[a] From γ-ray singles spectra (2005Sy01).
[b] From $\gamma\gamma$ data (2005Sy01).
[c] Average value of γ intensities from γ-ray singles and $\gamma\gamma$ data.
[d] Additional information 1.
[e] Placement of transition in the level scheme is uncertain.

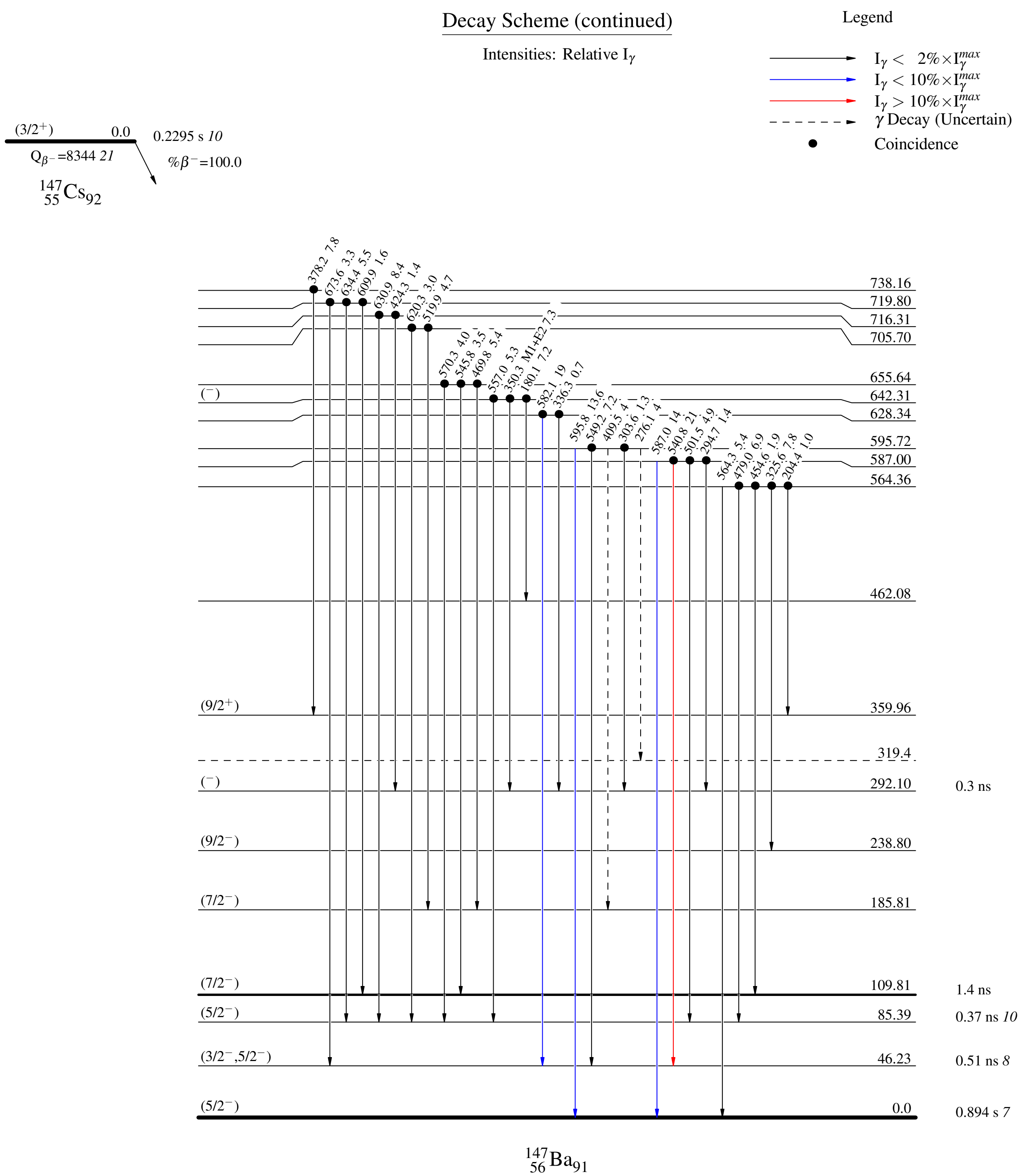
^{147}Cs β^- decay 2005Sy01



^{147}Cs β^- decay 2005Sy01

Decay Scheme (continued)

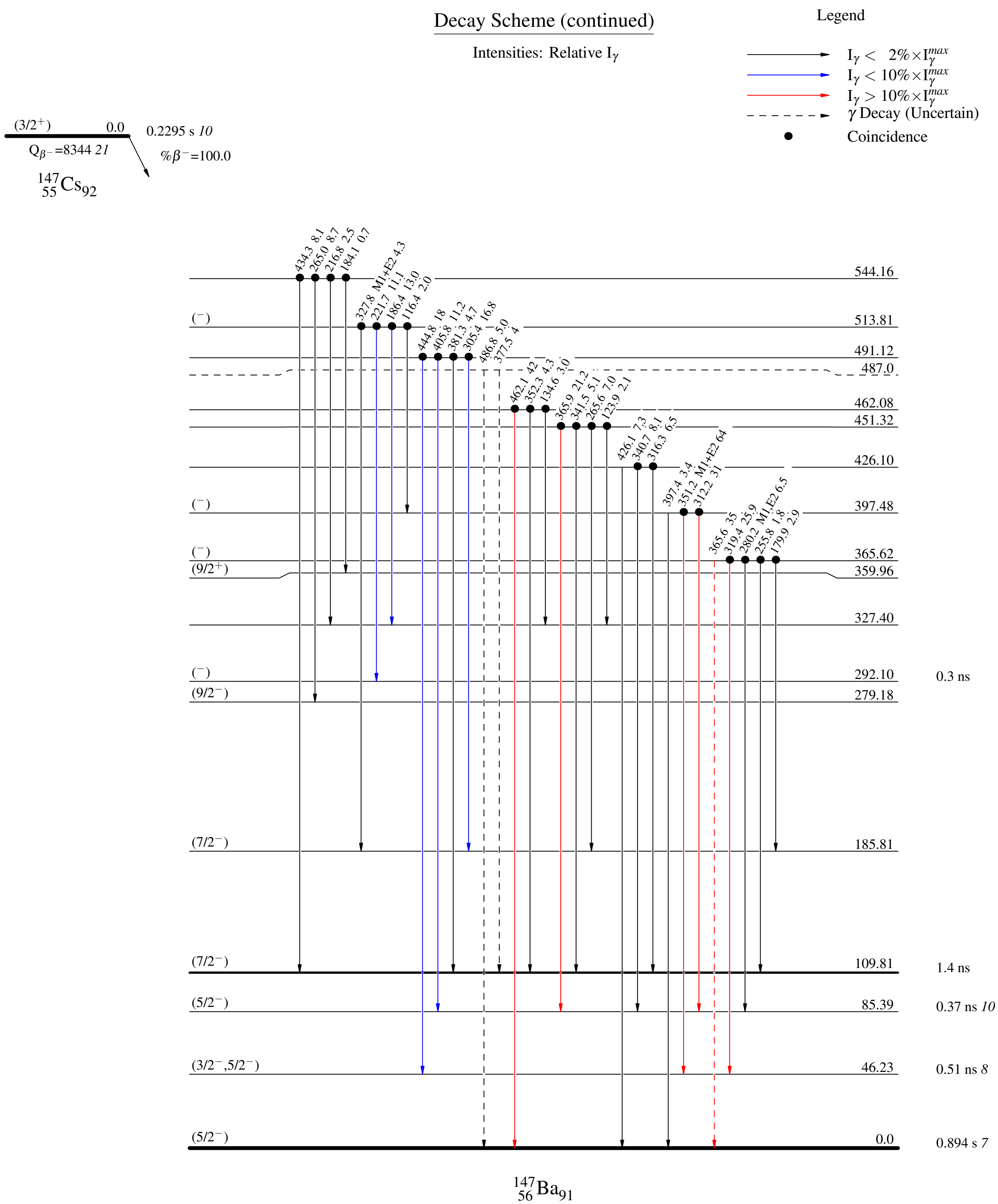
Intensities: Relative I_γ



^{147}Cs β^- decay 2005Sy01

Decay Scheme (continued)

Intensities: Relative I_γ



^{147}Cs β^- decay 2005Sy01

Decay Scheme (continued)

Intensities: Relative I_γ