^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	P. K. Joshi, B. Singh, S. Singh, A. K. Jain	NDS 138, 1 (2016)	15-Oct-2016

Parent: ^{139}Cs: E=0.0; J$^\pi$=7/2$^+$; $T_{1/2}$=9.27 min *5*; Q(β^-)=4213 *3*; %β^- decay=100.0

^{139}Cs-J$^\pi$,$T_{1/2}$: From ^{139}Cs Adopted Levels.

^{139}Cs-Q(β^-): From 2012Wa38.

1980Le03: measured Eγ, Iγ, $\gamma\gamma$-coin; deduced levels, Q(β).

1973Ad04 (also 1972LeYH): measured Eβ, $\beta\gamma$-coin; deduced Q(β.

Decay scheme is basically as proposed by 1980Le03 with following modifications suggested in 1981Pe04 Nuclear Data Sheets evaluation: 1. The placement of the 619.7γ deexciting a 2159 level was removed. 2. The placement of 1539.09γ deexciting the 1539 level was removed. 3. A level at 2606 was added. 1980Le03 apparently assumed that the 1539 level observed by 1973Ad04 differed from the 1539, L=5 level observed in (d,p). 1981Pe04 assumed that the levels were the same, which seems to be confirmed by ^{136}Xe(α,nγ) work of 1987Pr06. 1981Pe04 introduced a second level at 2606 apparently on the basis of the existence of the 1067γ feeding the 1539 level; however, since this γ was not placed on the basis of $\gamma\gamma$-coincidences, evaluators have not adopted the second 2606 level.

1997Gr09 (also 1994He33, 1992Gr18) measured summed γ-ray spectrum (TAGS, total absorption γ-ray spectrometer; NaI(Tl) well) and $\beta\gamma$-coincidences (Si-NaI(Tl) well). The spectra were analyzed based on the response functions for monoenergetic neutrons and electrons computed with a Monte Carlo code. The β-feeding distributions as a function of the excitation energy of the state were deduced. Analysis of the ^{139}Cs β^- spectra was based on ^{139}Cs β^- decay scheme in 1989Bu12 evaluation and Iβ^-(g.s.)=85.0% *34* (1992Gr21, 1997Gr09). The decay scheme in 1989Bu12 was modified by the adjustment of Iβ^-'s, the addition of a state at 3200 keV, and the lowering of the 1283 state to 1273; this resulted in excellent agreement between the measured and simulated spectra. The agreement of Iβ values between the simulation and 1989Bu12 Nuclear Data Sheets evaluation is also good, particularly below 2600 keV.

Others: 1978Wu04, 1970RuZR, 1969Ca03, 1966Zh02.

^{139}Ba Levels

E(level)	J$^\pi$ †
0.0	7/2$^-$
627.319 *22*	3/2$^-$
1082.04 *5*	(1/2)$^-$
1283.32 *3*	(9/2)$^-$
1308.21 *5*	(11/2$^-$)
1420.67 *4*	(5/2)$^-$
1538.97 *11*	(13/2)$^+$
1620.73 *6*	(7/2$^-$,9/2$^+$)
1680.78 *4*	(7/2)$^-$
1698.69 *5*	(5/2)$^-$
1748.29 *5*	3/2$^-$
1817.78 *4*	(1/2$^-$,3/2,5/2$^-$)
1851.03 *6*	(11/2$^-$,9/2,7/2$^-$)
1877.38 *4*	(5/2$^-$ to 11/2$^-$)
1887.54 *5*	(5/2$^-$,7/2,9/2$^-$)
1933.48 *5*	(7/2)$^-$
1949.13 *6*	(3/2$^-$,5/2$^+$)
1998.25 *6*	(7/2$^-$,9/2,11/2$^-$)
2020.89 *10*	(5/2$^-$,7/2$^-$)
2037.97 *5*	(3/2$^-$,5/2,7/2$^-$)
2079.06 *14*	(7/2$^-$,9/2,11/2$^-$)
2089.89 *6*	(5/2$^-$,7/2$^-$)
2100.08 *11*	(5/2$^-$,7/2$^-$)
2110.85 *6*	(5/2$^-$ to 11/2$^-$)
2157.00 *8*	3/2$^-$,5/2$^+$
2158.87 *16*	3/2$^-$,5/2$^+$

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

^{139}Ba Levels (continued)

E(level)	J^{π} †	Comments
2166.72 *19*	(7/2$^-$)	
2173.95 *5*	(5/2$^-$,7/2$^-$)	
2218.93 *7*	(3/2$^-$,5/2,7/2$^-$)	
2229.79 *9*	(5/2$^-$ to 11/2$^-$)	
2249.85 *24*	(5/2$^-$ to 11/2$^-$)	
2304.88 *8*	(5/2$^-$,7/2$^-$)	
2349.81 *3*	5/2$^-$,7/2$^-$	
2375.80 *8*	(5/2$^-$,7/2,9/2$^-$)	
2380.70 *7*	(3/2$^-$ to 11/2$^-$)	
2461.67 *7*	(5/2$^-$,7/2,9/2$^-$)	
2524.30 *11*	(7/2$^-$,9/2,11/2$^-$)	
2529.69 *16*	(3/2$^-$ to 9/2$^-$)	
2531.83 *5*	(3/2$^-$,5/2,7/2$^-$)	
2605.74 *4*	(3/2$^-$ to 9/2$^-$)	
2649.38 *7*	(3/2$^-$,5/2,7/2$^-$)	
2847.75 *7*	(5/2$^-$ to 11/2$^-$)	
2994.43 *9*	(5/2$^-$,7/2,9/2$^-$)	
2997.31 *8*	(7/2$^-$,9/2)	
3200?		E(level): Pseudo level introduced from TAGS analysis (1997Gr09). May correspond to the 3177 or 3231 states in (d,p). J=5/2,7/2,9/2 implied from log *ft*=7.2 suggests that this level probably does not correspond to L=(1), J^{π}=(1/2$^-$,3/2$^-$) 3163 and/or 3210 levels in (d,p).
3270.28 *19*	(5/2,7/2,9/2)	
3401.39 *14*	5/2$^-$,7/2$^-$	
3418.79 *14*	(5/2,7/2,9/2)	
3434.45 *21*	(5/2,7/2,9/2)	
3464.40 *7*	(5/2$^-$,7/2$^-$)	
3665.66 *8*	5/2,7/2,9/2	
3674.62 *14*	(5/2,7/2$^-$)	
3701.95 *14*	(5/2$^-$,7/2,9/2$^-$)	
3724.19 *14*	(5/2,7/2$^-$)	
3769.21 *11*	(5/2,7/2,9/2)	
3820.05 *24*	(5/2,7/2,9/2)	
3839.73 *15*	(5/2,7/2,9/2)	
3853.93 *16*	(5/2,7/2,9/2)	
3887.9 *3*	(5/2,7/2,9/2)	
3912.27 *21*	(5/2,7/2,9/2)	
3950.84 *12*	(5/2)$^+$	

† From the Adopted Levels.

β^- radiations

1975Al11 measured total absorption γ spectrum and deduced β strength function. See also 1973Jo02.

1992Gr21 measured Iβ^-(g.s.); $4\pi\gamma$-β (NaI(Tl) well-Si); while 1997Gr09 (also 1994He33) measured total absorption gamma spectrum (TAGS).

$\beta\gamma$-coincidences are from 1973Ad04, 1972LeYH, and 1970RuZR (Si,NaI).

<E$_\beta$>=1.73 MeV *5* (1982Al01. Si(Li)) in poor agreement with <E$_\beta$>=1.659 MeV *2* from decay scheme.

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ⁻[†#]	Log *ft*	Comments
(262 *3*)	3950.84	0.099 *22*	5.3 *1*	av Eβ=73.66 *94* Iβ=0.017 (1997Gr09).
(301 *3*)	3912.27	0.012 *3*	6.4 *1*	av Eβ=85.79 *96* Iβ=0.011 (1997Gr09).
(325 *3*)	3887.9	0.0078 *21*	6.7 *1*	av Eβ=93.60 *98* Iβ=0.007 (1997Gr09).
(359 *3*)	3853.93	0.019 *4*	6.5 *1*	av Eβ=104.68 *99* Iβ=0.021 (1997Gr09).
(373 *3*)	3839.73	0.033 *8*	6.3 *1*	av Eβ=109.4 *10* Iβ=0.017 (1997Gr09).
(393 *3*)	3820.05	0.011 *3*	6.9 *1*	av Eβ=115.9 *10* Iβ=0.010 (1997Gr09).
(444 *3*)	3769.21	0.044 *10*	6.4 *1*	av Eβ=133.2 *11* Iβ=0.22 (1997Gr09).
(489 *3*)	3724.19	0.034 *8*	6.7 *1*	av Eβ=148.8 *11* Iβ=0.043 (1997Gr09).
(511 *3*)	3701.95	0.061 *14*	6.5 *1*	av Eβ=156.7 *11* Iβ=0.085 (1997Gr09).
(538 *3*)	3674.62	0.053 *12*	6.6 *1*	av Eβ=166.4 *11* Iβ=0.085 (1997Gr09).
(547 *3*)	3665.66	0.15 *3*	6.2 *1*	av Eβ=169.6 *11* Iβ=0.38 (1997Gr09).
(749 *3*)	3464.40	0.19 *4*	6.6 *1*	av Eβ=244.4 *12* Iβ=0.153 (1997Gr09).
(779 *3*)	3434.45	0.038 *13*	7.3 *2*	av Eβ=256.0 *12* Iβ=0.036 (1997Gr09).
(794 *3*)	3418.79	0.069 *15*	7.1 *1*	av Eβ=262.0 *12* Iβ=0.21 (1997Gr09).
(812 *3*)	3401.39	0.029 *7*	7.5 *1*	av Eβ=268.8 *12* Iβ=0.085 (1997Gr09).
(943 *3*)	3270.28	0.025 *6*	7.8 *1*	av Eβ=320.7 *12* Iβ=0.162 (1997Gr09).
(1013[@] *3*)	3200?	0.145	7.2	av Eβ=349.2 *13* Iβ⁻: from the TAGS analysis (1997Gr09).
(1216 *3*)	2997.31	0.14 *3*	7.5 *1*	av Eβ=433.0 *13* Iβ=0.170 (1997Gr09).
(1219 *3*)	2994.43	0.117 *25*	7.6 *1*	av Eβ=434.3 *13* Iβ=0.170 (1997Gr09).
(1365 *3*)	2847.75	0.14 *3*	7.7[‡] *1*	av Eβ=496.4 *13* Iβ=0.21 (1997Gr09).
(1564 *3*)	2649.38	0.24 *7*	7.7[‡] *1*	av Eβ=582.1 *13* Iβ=0.28 (1997Gr09).
(1607 *3*)	2605.74	0.56 *11*	7.3 *1*	av Eβ=601.2 *14* Iβ=0.47 (1997Gr09).
(1681 *3*)	2531.83	0.54 *11*	7.4 *1*	av Eβ=633.6 *14* Iβ=0.54 (1997Gr09).
(1683 *3*)	2529.69	0.12 *4*	8.1[‡] *2*	av Eβ=634.6 *14* Iβ=0.170 (1997Gr09).
(1689 *3*)	2524.30	0.077 *17*	8.3[‡] *1*	av Eβ=637.0 *14* Iβ=0.128 (1997Gr09).
(1751 *3*)	2461.67	0.12 *3*	8.2[‡] *1*	av Eβ=664.6 *14* Iβ=0.128 (1997Gr09).
(1832 *3*)	2380.70	0.17 *4*	8.1[‡] *1*	av Eβ=700.5 *14* Iβ=0.170 (1997Gr09).
(1837 *3*)	2375.80	0.15 *3*	8.1[‡] *1*	av Eβ=702.7 *14*

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ−[†#]	Log *ft*	Comments
				Iβ=0.141 (1997Gr09).
(1863 *3*)	2349.81	1.21 *25*	7.3 *1*	av Eβ=714.2 *14* Iβ=1.19 (1997Gr09).
(1908 *3*)	2304.88	0.092 *20*	8.4[‡] *1*	av Eβ=734.3 *14* Iβ=0.21 (1997Gr09).
(1963 *3*)	2249.85	0.028 *8*	9.0[‡] *1*	av Eβ=758.9 *14* Iβ=0.043 (1997Gr09).
(1983 *3*)	2229.79	0.092 *32*	8.5[‡] *2*	av Eβ=767.9 *14* Iβ=0.062 (1997Gr09).
(1994 *3*)	2218.93	0.13 *3*	8.4[‡] *1*	av Eβ=772.8 *14* Iβ=0.102 (1997Gr09).
(2039 *3*)	2173.95	0.29 *6*	8.0[‡] *1*	av Eβ=793.0 *14* Iβ=0.24 (1997Gr09).
(2046 *3*)	2166.72	0.036 *10*	8.9[‡] *1*	av Eβ=796.2 *14* Iβ=0.032 (1997Gr09).
(2054 *3*)	2158.87	0.047 *12*	8.8[‡] *1*	av Eβ=799.7 *14* Iβ=0.058 (1997Gr09).
(2056 *3*)	2157.00	0.021 *10*	9.2[‡] *2*	av Eβ=800.6 *14* Iβ=0.017 (1997Gr09).
(2102 *3*)	2110.85	0.77 *16*	7.7[‡] *1*	av Eβ=821.4 *14* Iβ=0.62 (1997Gr09).
(2113 *3*)	2100.08	0.048 *13*	8.9[‡] *1*	av Eβ=826.2 *14* Iβ=0.041 (1997Gr09).
(2123 *3*)	2089.89	0.105 *24*	8.6[‡] *1*	av Eβ=830.8 *14* Iβ=0.094 (1997Gr09).
(2134 *3*)	2079.06	0.058 *13*	8.8[‡] *1*	av Eβ=835.7 *14* Iβ=0.051 (1997Gr09).
(2175 *3*)	2037.97	0.19 *4*	8.3[‡] *1*	av Eβ=854.3 *14* Iβ=0.162 (1997Gr09).
(2192 *3*)	2020.89	0.16 *6*	8.4[‡] *2*	av Eβ=862.0 *14* Iβ=0.153 (1997Gr09).
(2215 *3*)	1998.25	0.110 *23*	8.6[‡] *1*	av Eβ=872.3 *14* Iβ=0.111 (1997Gr09).
(2264 *3*)	1949.13	0.23 *5*	8.3[‡] *1*	av Eβ=894.5 *14* Iβ=0.21 (1997Gr09).
(2280 *3*)	1933.48	0.25 *6*	8.3[‡] *1*	av Eβ=901.6 *14* Iβ=0.170 (1997Gr09).
(2325 *3*)	1887.54	0.27 *6*	8.3[‡] *1*	av Eβ=922.5 *14* Iβ=0.20 (1997Gr09).
(2336 *3*)	1877.38	0.36 *8*	8.2[‡] *1*	av Eβ=927.2 *14* Iβ=0.30 (1997Gr09).
(2362 *3*)	1851.03	0.13 *3*	8.6[‡] *1*	av Eβ=939.1 *14* Iβ=0.170 (1997Gr09).
(2395[@] *3*)	1817.78	<0.024	>9.4[‡]	av Eβ=954.3 *14* Iβ=0.060 (1997Gr09).
(2465 *3*)	1748.29	0.026 *9*	10.6[1u] *2*	av Eβ=977.5 *14* Iβ=0.026 (1997Gr09).
(2514 *3*)	1698.69	0.107 *24*	8.8[‡] *1*	av Eβ=1008.7 *14* Iβ=0.094 (1997Gr09).
(2532 *3*)	1680.78	0.37 *8*	8.3[‡] *1*	av Eβ=1016.9 *14* Iβ=0.21 (1997Gr09).

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^- [†#]	Log *ft*	Comments
				E(decay): 1981De25 obtained Eβ^-=2790 *500* in $\beta\gamma$-coin.
(2592 *3*)	1620.73	0.40 *9*	8.3[‡] *1*	av Eβ=1044.4 *14* Iβ=0.34 (1997Gr09).
(2674[@] *3*)	1538.97	0.031 *7*	9.5[‡] *1*	av Eβ=1082.0 *14* Iβ=0.21 (1997Gr09).
(2792 *3*)	1420.67	0.36 *9*	8.5[‡] *1*	av Eβ=1136.4 *14* Iβ=0.21 (1997Gr09).
(2905 *3*)	1308.21	0.22 *5*	8.8[‡] *1*	av Eβ=1188.3 *14* Iβ=0.12 (1997Gr09).
(2930 *3*)	1283.32	6.2 *13*	7.4[‡] *1*	av Eβ=1199.8 *14* Iβ=5.2 (1997Gr09). E(decay): 1981De25 obtained Eβ^-=2888 *40* in $\beta\gamma$-coin.
(3131[@] *3*)	1082.04	<0.04	>9.7[‡]	av Eβ=1293.0 *14* Iβ=0.0 (1997Gr09).
(3586[@] *3*)	627.319	<0.02	>11.7[1u]	av Eβ=1486.8 *14* Iβ=0.0 (1997Gr09). E(decay): 1981De25 obtained Eβ^-=3600 *150* in $\beta\gamma$-coin.
(4213 *3*)	0.0	84.5 *31*	6.88[‡] *2*	av Eβ=1797.7 *14* Iβ^-: other: 85.0 *34* (1992Gr21,1997Gr09) and 80 *5* from statistical analysis of β spectra using the relative Iβ of 1980Le03 (1986HeZY). E(decay): 4213 *5* from 1981De25 (β's, $\beta\gamma$-coin; mag spect, Ge).

† Deduced from γ-intensity balances. The values from TAGS measurement (1997Gr09) are given under comments.
‡ log $f^{1u}t$>8.5.
\# Absolute intensity per 100 decays.
@ Existence of this branch is questionable.

γ(^{139}Ba)

Iγ normalization: weighted average of 0.068 *16* from ΣIγ(to g.s.)=15.0 *34* (Iβ^-(g.s.)=85.0% *34* from 1992Gr21) and 0.083 *32* from Iγ(1283.3γ) relative to Iγ(165.8γ; ^{139}Ba) (corrected for time dependence of ^{139}Cs-^{139}Ba activity ratio) and Iγ(165.8γ; ^{139}Ba)=23.76% *25* (1980Ge04). Iγ(1283.3γ)/Iγ(165.8γ; ^{139}Ba) derived by evaluators from Iγ normalization=0.0077 *30* (1980Le03) and Iγ(165.8γ; ^{139}Ba)=22% *1* (1976GlZV).

E_γ [†]	I_γ [†a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α [b]	Comments
188.88 *20*	0.11 *2*	1887.54	(5/2⁻,7/2,9/2⁻)	1698.69	(5/2)⁻			
196.51 *18*	0.12 *2*	1877.38	(5/2⁻ to 11/2⁻)	1680.78	(7/2)⁻			
230.76 *9*	0.43 *4*	1538.97	(13/2)⁺	1308.21	(11/2⁻)			
233.45 *22*	0.13 *3*	2110.85	(5/2⁻ to 11/2⁻)	1877.38	(5/2⁻ to 11/2⁻)			
249.89 *18*	0.14 *3*	2349.81	5/2⁻,7/2⁻	2100.08	(5/2⁻,7/2⁻)			
260.6 *4*	0.10 *3*	1680.78	(7/2)⁻	1420.67	(5/2)⁻	[M1,E2]	0.0707 *12*	α(K)=0.0587 *18*; α(L)=0.0095 *16*; α(M)=0.0020 *4*; α(N)=0.00043 *8*; α(O)=6.2×10^{-5} *9* α(P)=3.6×10^{-6} *4*
267.6 *3*	0.13 *4*	3701.95	(5/2⁻,7/2,9/2⁻)	3434.45	(5/2,7/2,9/2)			
312.31 *21*	0.11 *2*	1620.73	(7/2⁻,9/2⁺)	1308.21	(11/2⁻)			

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

$\gamma(^{139}Ba)$ (continued)

E_γ [†]	I_γ [†a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α [b]	Comments
339.4 *4*	0.08 *3*	2157.00	3/2⁻,5/2⁺	1817.78	(1/2⁻,3/2,5/2⁻)			
357.01 *16*	0.19 *3*	2037.97	(3/2⁻,5/2,7/2⁻)	1680.78	(7/2)⁻			
375.91[‡d] *7*	0.54 *4*	2605.74	(3/2⁻ to 9/2⁻)	2229.79	(5/2⁻ to 11/2⁻)			
396.9 *3*	0.22 *6*	1817.78	(1/2⁻,3/2,5/2⁻)	1420.67	(5/2)⁻			
401.08 *22*	0.14 *3*	2218.93	(3/2⁻,5/2,7/2⁻)	1817.78	(1/2⁻,3/2,5/2⁻)			
[x]404.61 *25*	0.11 *3*							
416.49 *22*	0.17 *4*	2349.81	5/2⁻,7/2⁻	1933.48	(7/2)⁻			
419.3 *3*	0.13 *4*	2100.08	(5/2⁻,7/2⁻)	1680.78	(7/2)⁻			
430.20 *16*	0.50 *4*	2110.85	(5/2⁻ to 11/2⁻)	1680.78	(7/2)⁻			
434.23 *20*	0.19 *4*	2524.30	(7/2⁻,9/2,11/2⁻)	2089.89	(5/2⁻,7/2⁻)			
448.76 *12*	0.42 *5*	2605.74	(3/2⁻ to 9/2⁻)	2157.00	3/2⁻,5/2⁺			
454.66 *6*	1.82 *11*	1082.04	(1/2)⁻	627.319	3/2⁻	[M1,E2]	0.0148 *20*	α(K)=0.0126 *18*; α(L)=0.00176 *10*; α(M)=0.000364 *18*; α(N)=7.8×10⁻⁵ *5*; α(O)=1.18×10⁻⁵ *9* α(P)=7.9×10⁻⁷ *15*
466.70 *12*	0.28 *3*	1887.54	(5/2⁻,7/2,9/2⁻)	1420.67	(5/2)⁻			
505.4 *3*	0.13 *4*	2605.74	(3/2⁻ to 9/2⁻)	2100.08	(5/2⁻,7/2⁻)			
515.86 *7*	0.72 *6*	2605.74	(3/2⁻ to 9/2⁻)	2089.89	(5/2⁻,7/2⁻)			
528.20 *10*	0.50 *17*	2461.67	(5/2⁻,7/2,9/2⁻)	1933.48	(7/2)⁻			
531.98 *4*	2.97 *16*	2349.81	5/2⁻,7/2⁻	1817.78	(1/2⁻,3/2,5/2⁻)			
538.35 *24*	0.18 *4*	2218.93	(3/2⁻,5/2,7/2⁻)	1680.78	(7/2)⁻			
542.71 *15*	0.32 *4*	1851.03	(11/2⁻,9/2,7/2⁻)	1308.21	(11/2⁻)			
558.1 *3*	0.12 *4*	2375.80	(5/2⁻,7/2,9/2⁻)	1817.78	(1/2⁻,3/2,5/2⁻)			
567.72[c] *5*	1.37[c] *11*	1851.03	(11/2⁻,9/2,7/2⁻)	1283.32	(9/2)⁻			
567.72[c] *5*	0.50[c] *11*	2605.74	(3/2⁻ to 9/2⁻)	2037.97	(3/2⁻,5/2,7/2⁻)			
594.02 *5*	0.98 *6*	1877.38	(5/2⁻ to 11/2⁻)	1283.32	(9/2)⁻			
598.17 *18*	0.16 *3*	2218.93	(3/2⁻,5/2,7/2⁻)	1620.73	(7/2⁻,9/2⁺)			
601.48 *5*	0.89 *5*	2349.81	5/2⁻,7/2⁻	1748.29	3/2⁻			
604.22 *6*	0.59 *4*	1887.54	(5/2⁻,7/2,9/2⁻)	1283.32	(9/2)⁻			
613.4 *3*	0.21 *6*	2994.43	(5/2⁻,7/2,9/2⁻)	2380.70	(3/2⁻ to 11/2⁻)			
616.91 *21*	0.33 *6*	2037.97	(3/2⁻,5/2,7/2⁻)	1420.67	(5/2)⁻			
[x]619.7[#] *3*	0.22 *6*							
627.24 *3*	21.4 *11*	627.319	3/2⁻	0.0	7/2⁻			
651.08 *7*	0.64 *5*	2349.81	5/2⁻,7/2⁻	1698.69	(5/2)⁻			
656.58 *13*	0.43 *5*	2605.74	(3/2⁻ to 9/2⁻)	1949.13	(3/2⁻,5/2⁺)			
666.07 *11*	0.40 *4*	1748.29	3/2⁻	1082.04	(1/2)⁻			
668.97 *8*	0.58 *5*	2349.81	5/2⁻,7/2⁻	1680.78	(7/2)⁻			
672.21 *15*	0.27 *4*	2605.74	(3/2⁻ to 9/2⁻)	1933.48	(7/2)⁻			
690.04 *9*	0.30 *3*	1998.25	(7/2⁻,9/2,11/2⁻)	1308.21	(11/2⁻)			
714.90 *6*	0.99 *6*	1998.25	(7/2⁻,9/2,11/2⁻)	1283.32	(9/2)⁻			
728.38 *9*	0.56 *5*	2605.74	(3/2⁻ to 9/2⁻)	1877.38	(5/2⁻ to 11/2⁻)			
735.68 *9*	0.89 *7*	1817.78	(1/2⁻,3/2,5/2⁻)	1082.04	(1/2)⁻			
737.60 *12*	0.60 *6*	2020.89	(5/2⁻,7/2⁻)	1283.32	(9/2)⁻			
770.56 *19*	0.23 *4*	2079.06	(7/2⁻,9/2,11/2⁻)	1308.21	(11/2⁻)			
[x]773.5 *3*	0.13 *4*							
788.3 *4*	0.12 *4*	2605.74	(3/2⁻ to 9/2⁻)	1817.78	(1/2⁻,3/2,5/2⁻)			
793.28 *7*	1.05 *7*	1420.67	(5/2)⁻	627.319	3/2⁻			
798.01 *14*	0.36 *5*	2218.93	(3/2⁻,5/2,7/2⁻)	1420.67	(5/2)⁻			
806.32 *21*	0.17 *3*	2089.89	(5/2⁻,7/2⁻)	1283.32	(9/2)⁻			
827.52 *7*	1.52 *10*	2110.85	(5/2⁻ to 11/2⁻)	1283.32	(9/2)⁻			
832.2 *3*	0.17 *6*	2649.38	(3/2⁻,5/2,7/2⁻)	1817.78	(1/2⁻,3/2,5/2⁻)			
849.7 *3*	0.14 *4*	2847.75	(5/2⁻ to 11/2⁻)	1998.25	(7/2⁻,9/2,11/2⁻)			
858.4 *3*	0.16 *4*	2166.72	(7/2⁻)	1308.21	(11/2⁻)			

Continued on next page (footnotes at end of table)

^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

$\gamma(^{139}Ba)$ (continued)

E_γ [†]	I_γ [†a]	E_i(level)	J_i^π	E_f	J_f^π
883.5 *3*	0.18 *5*	2166.72	$(7/2^-)$	1283.32	$(9/2)^-$
890.54 *8*	1.02 *7*	2173.95	$(5/2^-,7/2^-)$	1283.32	$(9/2)^-$
924.96 *8*	0.92 *7*	2605.74	$(3/2^-$ to $9/2^-)$	1680.78	$(7/2)^-$
929.18 *6*	3.20 *17*	2349.81	$5/2^-,7/2^-$	1420.67	$(5/2)^-$
933.0 *3*	0.18 *5*	3464.40	$(5/2^-,7/2^-)$	2531.83	$(3/2^-,5/2,7/2^-)$
946.46 *8*	1.37 *10*	2229.79	$(5/2^-$ to $11/2^-)$	1283.32	$(9/2)^-$
955.19 *19*	0.40 *6*	2375.80	$(5/2^-,7/2,9/2^-)$	1420.67	$(5/2)^-$
966.6 *3*	0.24 *6*	2249.85	$(5/2^-$ to $11/2^-)$	1283.32	$(9/2)^-$
973.0 *4*	0.18 *6*	3434.45	(5/2,7/2,9/2)	2461.67	$(5/2^-,7/2,9/2^-)$
1040.93 *22*	0.44 *4*	2461.67	$(5/2^-,7/2,9/2^-)$	1420.67	$(5/2)^-$
1059.9 *3*	0.21 *7*	3665.66	5/2,7/2,9/2	2605.74	$(3/2^-$ to $9/2^-)$
1063.7 *4*	0.14 *7*	2997.31	$(7/2^-,9/2)$	1933.48	$(7/2)^-$
[x]1067.06[@] *19*	0.33 *6*				
1076.94 *17*	0.36 *7*	2158.87	$3/2^-,5/2^+$	1082.04	$(1/2)^-$
1092.23 *12*	0.58 *3*	2375.80	$(5/2^-,7/2,9/2^-)$	1283.32	$(9/2)^-$
1108.93 *18*	0.56 *8*	2529.69	$(3/2^-$ to $9/2^-)$	1420.67	$(5/2)^-$
1110.9 *4*	0.37 *7*	2531.83	$(3/2^-,5/2,7/2^-)$	1420.67	$(5/2)^-$
1120.89 *10*	0.65 *6*	1748.29	$3/2^-$	627.319	$3/2^-$
1159.30 *17*	0.37 *5*	3464.40	$(5/2^-,7/2^-)$	2304.88	$(5/2^-,7/2^-)$
1178.35 *9*	0.93 *8*	2461.67	$(5/2^-,7/2,9/2^-)$	1283.32	$(9/2)^-$
1185.21 *17*	0.41 *6*	2605.74	$(3/2^-$ to $9/2^-)$	1420.67	$(5/2)^-$
1190.42 *6*	2.56 *15*	1817.78	$(1/2^-,3/2,5/2^-)$	627.319	$3/2^-$
1216.14 *19*	0.29 *5*	2524.30	$(7/2^-,9/2,11/2^-)$	1308.21	$(11/2^-)$
1240.93 *25*	0.21 *4*	2524.30	$(7/2^-,9/2,11/2^-)$	1283.32	$(9/2)^-$
1249.41 *22*	0.21 *4*	3270.28	(5/2,7/2,9/2)	2020.89	$(5/2^-,7/2^-)$
1283.23 *5*	100 *5*	1283.32	$(9/2)^-$	0.0	$7/2^-$
1306.09 *11*	1.47 *13*	1933.48	$(7/2)^-$	627.319	$3/2^-$
1308.13 *6*	5.2 *3*	1308.21	$(11/2^-)$	0.0	$7/2^-$
1316.4 *4*	0.18 *5*	2997.31	$(7/2^-,9/2)$	1680.78	$(7/2)^-$
1321.77 *6*	3.25 *18*	1949.13	$(3/2^-,5/2^+)$	627.319	$3/2^-$
1344.4 *4*	0.17 *5*	3434.45	(5/2,7/2,9/2)	2089.89	$(5/2^-,7/2^-)$
1353.92 *19*	0.30 *5*	3464.40	$(5/2^-,7/2^-)$	2110.85	$(5/2^-$ to $11/2^-)$
[x]1386.85 *24*	0.26 *5*				
1393.2 *3*	0.21 *5*	2020.89	$(5/2^-,7/2^-)$	627.319	$3/2^-$
1410.58 *7*	2.09 *12*	2037.97	$(3/2^-,5/2,7/2^-)$	627.319	$3/2^-$
1420.66 *6*	11.0 *6*	1420.67	$(5/2)^-$	0.0	$7/2^-$
1462.43 *19*	0.50 *8*	2089.89	$(5/2^-,7/2^-)$	627.319	$3/2^-$
1472.6 *5*	0.16 *7*	2100.08	$(5/2^-,7/2^-)$	627.319	$3/2^-$
1500.5 *3*	0.20 *5*	3674.62	$(5/2,7/2^-)$	2173.95	$(5/2^-,7/2^-)$
1529.3 *3*	0.36 *8*	2157.00	$3/2^-,5/2^+$	627.319	$3/2^-$
1531.2 *3*	0.30 *8*	2158.87	$3/2^-,5/2^+$	627.319	$3/2^-$
[x]1539.09[&] *14*	0.40 *4*				
1546.63 *13*	0.42 *5*	2173.95	$(5/2^-,7/2^-)$	627.319	$3/2^-$
1563.9 *4*	0.14 *4*	3674.62	$(5/2,7/2^-)$	2110.85	$(5/2^-$ to $11/2^-)$
1564.63 *13*	0.42 *5*	2847.75	$(5/2^-$ to $11/2^-)$	1283.32	$(9/2)^-$
1573.84 *15*	0.35 *4*	2994.43	$(5/2^-,7/2,9/2^-)$	1420.67	$(5/2)^-$
1591.73 *11*	0.73 *6*	2218.93	$(3/2^-,5/2,7/2^-)$	627.319	$3/2^-$
1600.7 *5*	0.27 *10*	3950.84	$(5/2)^+$	2349.81	$5/2^-,7/2^-$
1620.74 *6*	5.8 *3*	1620.73	$(7/2^-,9/2^+)$	0.0	$7/2^-$
1677.44 *10*	1.24 *9*	2304.88	$(5/2^-,7/2^-)$	627.319	$3/2^-$
1680.72 *6*	8.4 *4*	1680.78	$(7/2)^-$	0.0	$7/2^-$
1689.04 *25*	0.27 *5*	2997.31	$(7/2^-,9/2)$	1308.21	$(11/2^-)$
1698.66 *7*	2.46 *14*	1698.69	$(5/2)^-$	0.0	$7/2^-$
1711.09 *11*	1.09 *8*	2994.43	$(5/2^-,7/2,9/2^-)$	1283.32	$(9/2)^-$
1713.6 *4*	0.22 *6*	2997.31	$(7/2^-,9/2)$	1283.32	$(9/2)^-$

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

$\gamma(^{139}Ba)$ (continued)

E_γ [†]	I_γ [†a]	E_i(level)	J^π_i	E_f	J^π_f
1722.55 *9*	1.04 *7*	2349.81	5/2⁻,7/2⁻	627.319	3/2⁻
1737.9 *3*	0.42 *4*	3418.79	(5/2,7/2,9/2)	1680.78	(7/2)⁻
1748.6 *3*	0.21 *4*	1748.29	3/2⁻	0.0	7/2⁻
1768.19 *21*	0.19 *3*	3701.95	(5/2⁻,7/2,9/2⁻)	1933.48	(7/2)⁻
1793.63 *17*	0.30 *4*	3950.84	(5/2)⁺	2157.00	3/2⁻,5/2⁺
1814.6 *4*	0.17 *5*	3701.95	(5/2⁻,7/2,9/2⁻)	1887.54	(5/2⁻,7/2,9/2⁻)
1818.5 *3*	0.21 *5*	3839.73	(5/2,7/2,9/2)	2020.89	(5/2⁻,7/2⁻)
1850.7 *4*	0.14 *4*	1851.03	(11/2⁻,9/2,7/2⁻)	0.0	7/2⁻
1877.45 *7*	4.73 *25*	1877.38	(5/2⁻ to 11/2⁻)	0.0	7/2⁻
1887.57 *7*	3.05 *17*	1887.54	(5/2⁻,7/2,9/2⁻)	0.0	7/2⁻
1904.50 *7*	1.71 *10*	2531.83	(3/2⁻,5/2,7/2⁻)	627.319	3/2⁻
1933.48 *7*	3.39 *18*	1933.48	(7/2)⁻	0.0	7/2⁻
1949.26 *14*	0.46 *5*	1949.13	(3/2⁻,5/2⁺)	0.0	7/2⁻
1998.46 *15*	0.40 *4*	1998.25	(7/2⁻,9/2,11/2⁻)	0.0	7/2⁻
2003.4 *3*	0.20 *4*	3701.95	(5/2⁻,7/2,9/2⁻)	1698.69	(5/2)⁻
2020.76 *25*	1.8 *6*	2020.89	(5/2⁻,7/2⁻)	0.0	7/2⁻
2022.1 *5*	0.9 *6*	2649.38	(3/2⁻,5/2,7/2⁻)	627.319	3/2⁻
2038.10 *11*	0.59 *5*	2037.97	(3/2⁻,5/2,7/2⁻)	0.0	7/2⁻
2079.33 *19*	0.58 *7*	2079.06	(7/2⁻,9/2,11/2⁻)	0.0	7/2⁻
2089.91 *9*	1.89 *12*	2089.89	(5/2⁻,7/2⁻)	0.0	7/2⁻
2100.13 *17*	0.65 *8*	2100.08	(5/2⁻,7/2⁻)	0.0	7/2⁻
2110.91 *9*	9.1 *5*	2110.85	(5/2⁻ to 11/2⁻)	0.0	7/2⁻
2156.94 *13*	0.57 *6*	2157.00	3/2⁻,5/2⁺	0.0	7/2⁻
2166.7 *4*	0.17 *5*	2166.72	(7/2⁻)	0.0	7/2⁻
2173.98 *7*	2.78 *15*	2173.95	(5/2⁻,7/2⁻)	0.0	7/2⁻
2218.91 *23*	0.29 *4*	2218.93	(3/2⁻,5/2,7/2⁻)	0.0	7/2⁻
2229.9 *3*	0.19 *4*	2229.79	(5/2⁻ to 11/2⁻)	0.0	7/2⁻
2249.7 *4*	0.16 *4*	2249.85	(5/2⁻ to 11/2⁻)	0.0	7/2⁻
ˣ2269.5 *3*	0.20 *4*				
2304.97 *16*	0.42 *5*	2304.88	(5/2⁻,7/2⁻)	0.0	7/2⁻
2330.2 *6*	0.14 *6*	3950.84	(5/2)⁺	1620.73	(7/2⁻,9/2⁺)
ˣ2339.4 *5*	0.39 *9*				
2349.92 *6*	7.7 *4*	2349.81	5/2⁻,7/2⁻	0.0	7/2⁻
2352.6 *6*	0.31 *11*	3434.45	(5/2,7/2,9/2)	1082.04	(1/2)⁻
2375.95 *11*	0.96 *8*	2375.80	(5/2⁻,7/2,9/2⁻)	0.0	7/2⁻
2380.66 *7*	2.60 *15*	2380.70	(3/2⁻ to 11/2⁻)	0.0	7/2⁻
2418.9 *4*	0.17 *4*	3701.95	(5/2⁻,7/2,9/2⁻)	1283.32	(9/2)⁻
ˣ2422.16 *18*	0.40 *5*				
2524.47 *22*	0.39 *6*	2524.30	(7/2⁻,9/2,11/2⁻)	0.0	7/2⁻
2529.9 *3*	1.1 *3*	2529.69	(3/2⁻ to 9/2⁻)	0.0	7/2⁻
2531.84 *7*	5.8 *4*	2531.83	(3/2⁻,5/2,7/2⁻)	0.0	7/2⁻
2605.75 *6*	3.38 *19*	2605.74	(3/2⁻ to 9/2⁻)	0.0	7/2⁻
2649.32 *7*	2.32 *13*	2649.38	(3/2⁻,5/2,7/2⁻)	0.0	7/2⁻
ˣ2673.98 *18*	0.48 *6*				
2774.04 *13*	0.41 *4*	3401.39	5/2⁻,7/2⁻	627.319	3/2⁻
2836.88 *16*	0.38 *4*	3464.40	(5/2⁻,7/2⁻)	627.319	3/2⁻
2847.63 *8*	1.38 *8*	2847.75	(5/2⁻ to 11/2⁻)	0.0	7/2⁻
ˣ2978.99 *24*	0.18 *2*				
2997.32 *9*	1.19 *8*	2997.31	(7/2⁻,9/2)	0.0	7/2⁻
3047.29 *16*	0.41 *4*	3674.62	(5/2,7/2⁻)	627.319	3/2⁻
3096.4 *4*	0.12 *3*	3724.19	(5/2,7/2⁻)	627.319	3/2⁻
ˣ3171.57 *23*	0.25 *3*				
3270.2 *3*	0.14 *2*	3270.28	(5/2,7/2,9/2)	0.0	7/2⁻
3323.66 *15*	0.69 *7*	3950.84	(5/2)⁺	627.319	3/2⁻
ˣ3364.23 *11*	1.10 *8*				
3418.77 *15*	0.55 *5*	3418.79	(5/2,7/2,9/2)	0.0	7/2⁻

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^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09 (continued)

γ(^{139}Ba) (continued)

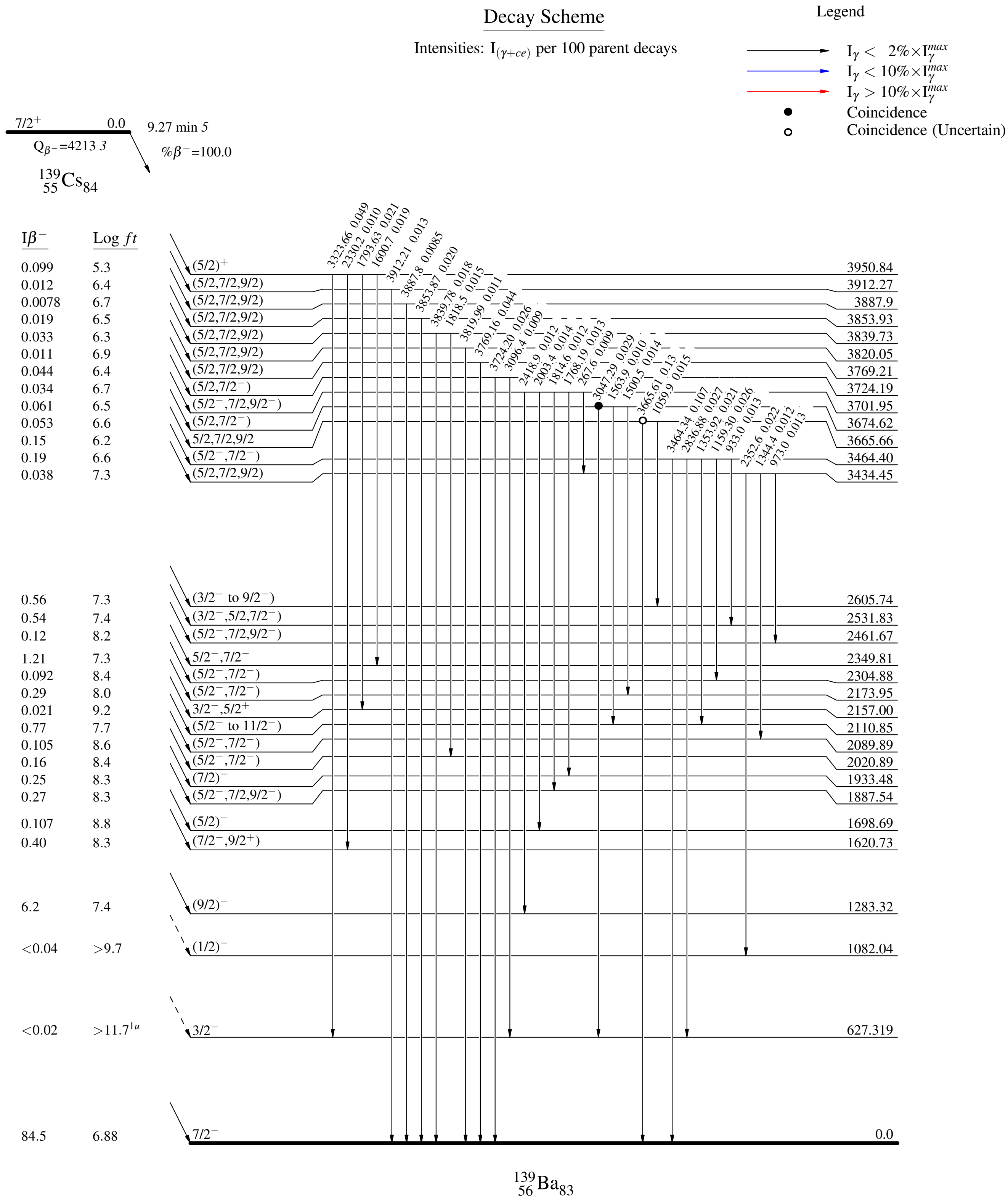
E_γ[†]	I_γ[†a]	E_i(level)	J_i^π	E_f	J_f^π
3464.34 *9*	1.51 *9*	3464.40	(5/2$^-$,7/2$^-$)	0.0	7/2$^-$
[x]3645.70 *13*	0.38 *3*				
3665.61 *8*	1.89 *11*	3665.66	5/2,7/2,9/2	0.0	7/2$^-$
3724.20 *15*	0.36 *3*	3724.19	(5/2,7/2$^-$)	0.0	7/2$^-$
3769.16 *11*	0.62 *4*	3769.21	(5/2,7/2,9/2)	0.0	7/2$^-$
3819.99 *24*	0.15 *2*	3820.05	(5/2,7/2,9/2)	0.0	7/2$^-$
3839.78 *17*	0.25 *2*	3839.73	(5/2,7/2,9/2)	0.0	7/2$^-$
3853.87 *16*	0.27 *2*	3853.93	(5/2,7/2,9/2)	0.0	7/2$^-$
3887.8 *3*	0.11 *2*	3887.9	(5/2,7/2,9/2)	0.0	7/2$^-$
3912.21 *21*	0.17 *2*	3912.27	(5/2,7/2,9/2)	0.0	7/2$^-$

[†] From 1980Le03, except as noted.
[‡] 1981Pe04 suggested placement from a second 2606 level.
[#] 1981Pe04 removed this γ from its position in the decay scheme of 1980Le03 (2159, ≤7/2$^-$, to 1539, 11/2$^+$,13/2$^+$) since such a transition would have M2,E3 multipolarity.
[@] Removed from its position in the decay scheme of 1980Le03 (2606, 3/2$^-$,5/2,7/2$^-$ to 1539, 11/2$^+$,13/2$^+$) since such a transition would have M2,E3 multipolarity or higher. 1981Pe04 suggested that this γ deexcites a second 2606 level.
[&] 1981Pe04 removed this γ from its position in the decay scheme of 1980Le03 (1539, 11/2$^+$,13/2$^+$ to g.s., 7/2$^-$) since such a transition would have M2,E3 multipolarity.
[a] For absolute intensity per 100 decays, multiply by 0.071 *14*.
[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] Multiply placed with intensity suitably divided.
[d] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09

Decay Scheme

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

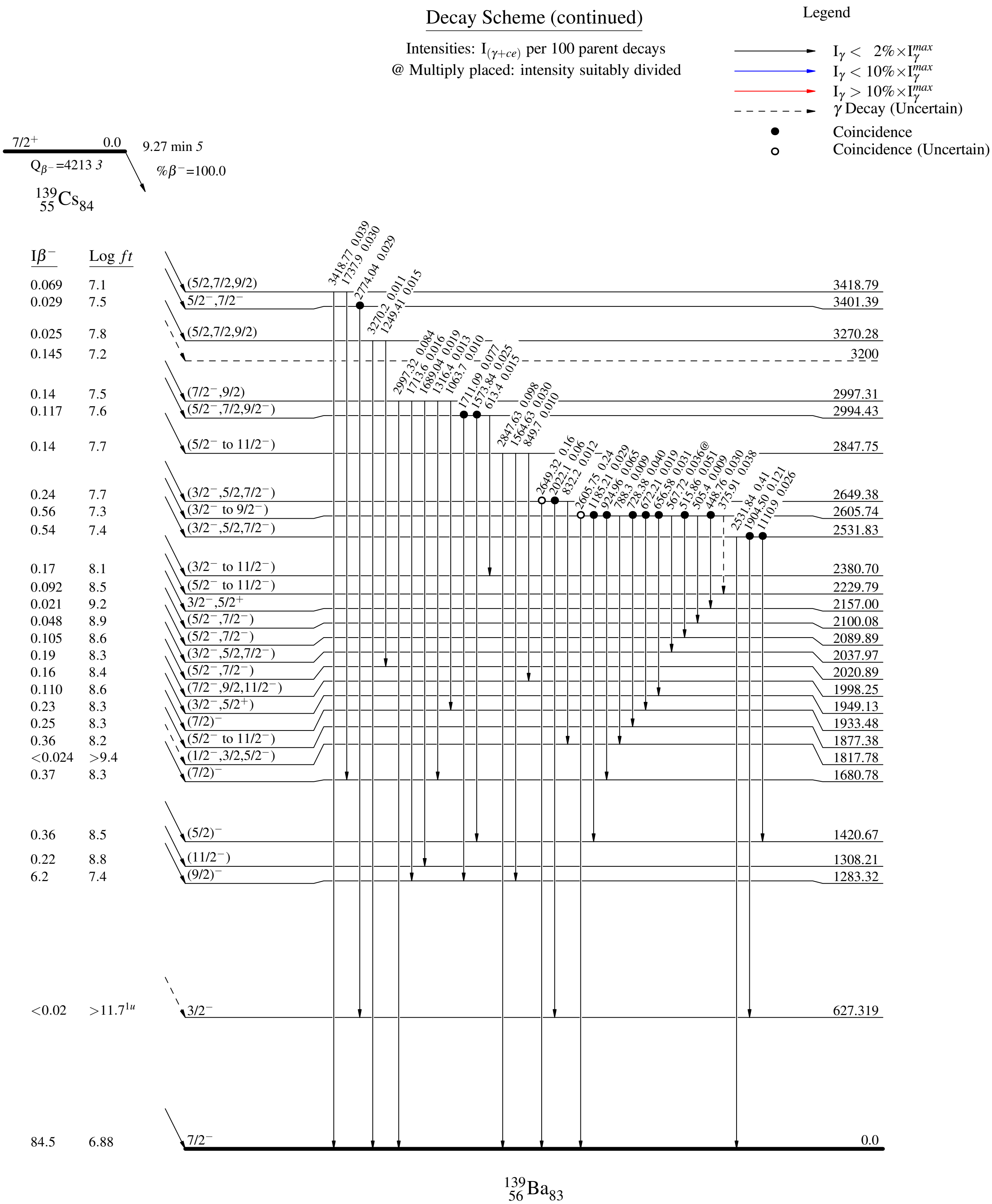


^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09

Decay Scheme (continued)

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

@ Multiply placed: intensity suitably divided

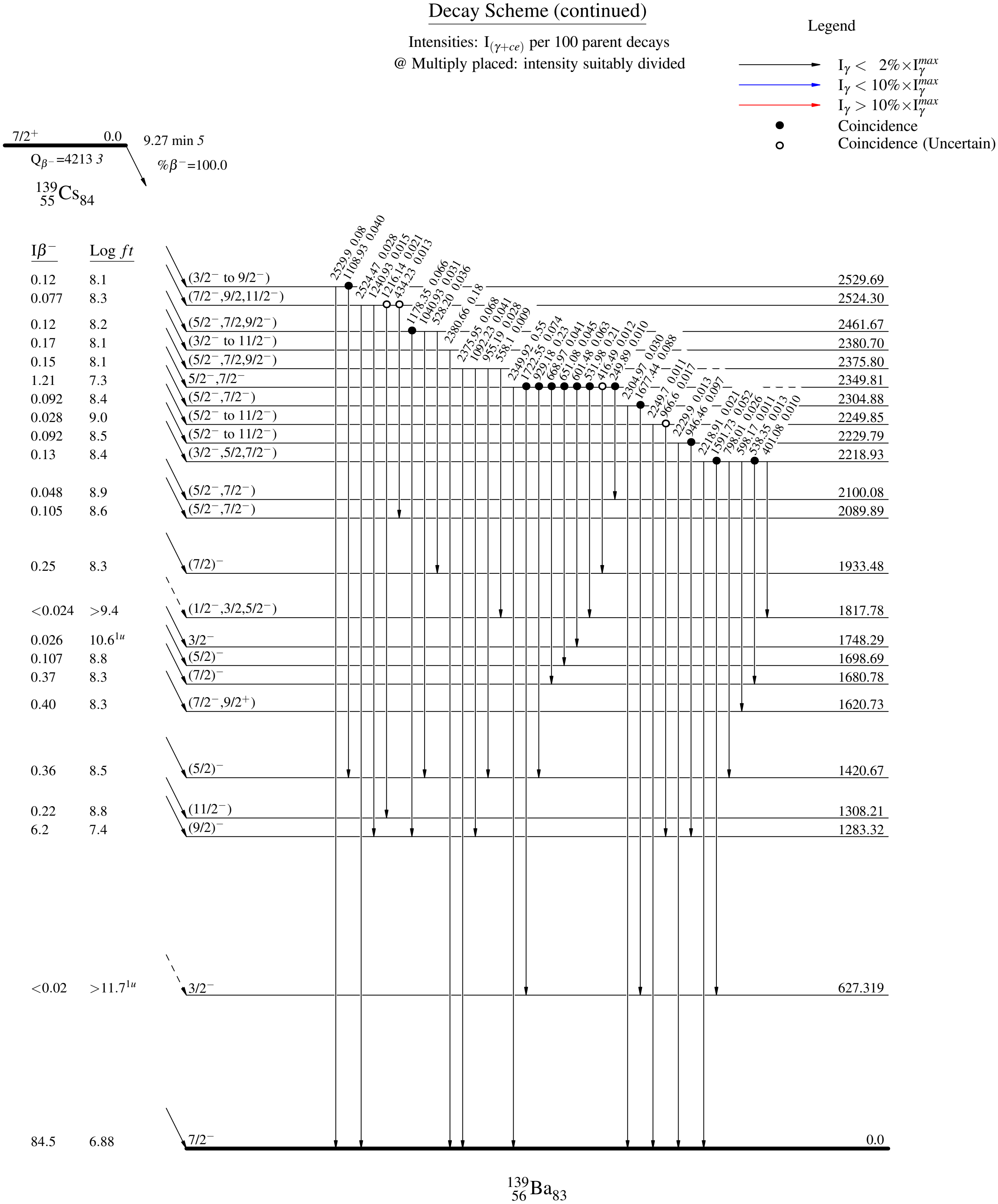


^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09

Decay Scheme (continued)

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

@ Multiply placed: intensity suitably divided



^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09

Decay Scheme (continued)

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

@ Multiply placed: intensity suitably divided

Legend

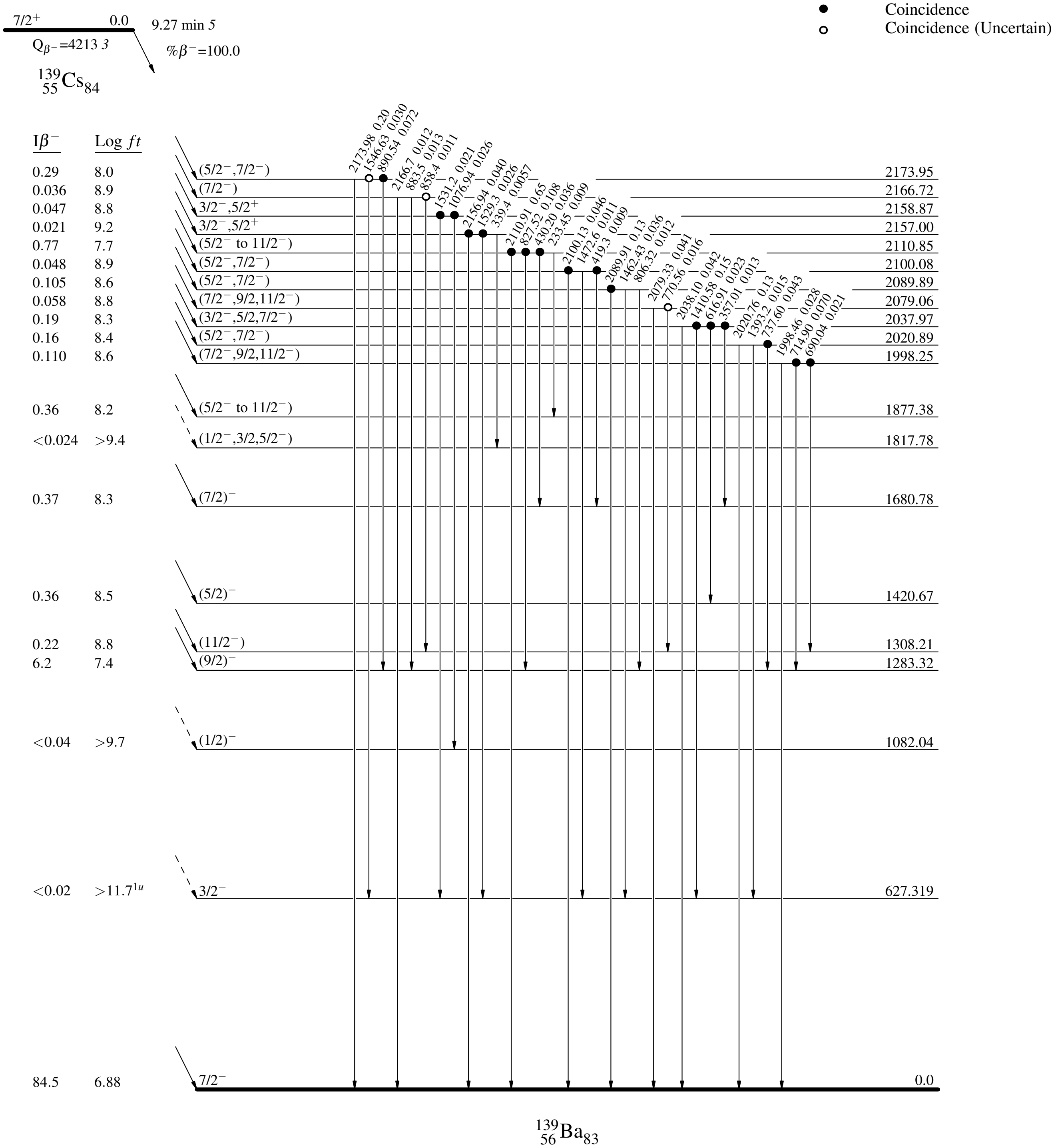
$I_\gamma < 2\% \times I_\gamma^{max}$

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

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

Coincidence

Coincidence (Uncertain)



^{139}Cs β^- decay (9.27 min) 1980Le03,1997Gr09

Decay Scheme (continued)

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

@ Multiply placed: intensity suitably divided