^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Janos Timar and Zoltan Elekes, Balraj Singh	NDS 121, 143 (2014)	31-May-2014

Parent: ^{129}Ba: E=8.42 *6*; J$^{\pi}$=7/2^{+}; $T_{1/2}$=2.135 h *10*; Q(ε)=2436 *11*; %ε+%β^{+} decay≈100.0

^{129}Ba-Q(ε): From 2012Wa38.

^{129}Ba-E,J$^{\pi}$,$T_{1/2}$: From ^{129}Ba Adopted Levels.

^{129}Ba-%ε+%β^{+} decay: %β^{-}≈100 assumed; %IT is unknown.

The decay schemes of the g.s. and isomer of ^{129}Cs seem complex, especially for the isomer decay. First level scheme was proposed in 1970Is04, later expanded by 1972Ta02 and 1973Is04. First attempt to tentatively separate the decay schemes was made in 1972-NDS (1972Ho55). Based on detailed $\gamma\gamma$ coincidences with two Ge detectors and producing the source in different reactions producing different composition of low-spin and high-spin activities, 1983TaZI present evidence for two separate decay schemes, which are adopted here, although labeled as tentative by 1983TaZI. For the isomer decay, the gamma-ray energies and the decay scheme are almost identical to those given in 1973Is04. There is good agreement of gamma-ray energies between 1973Is04 (and 1983TaZI) and 1972Ta02, but a large number of differences exist in the placement of transitions and levels. The evaluators prefer to adopt level schemes from 1983TaZI and 1973Is04 due to better $\gamma\gamma$ coincidence data with two Ge(Li) detectors. However, in the opinion of the evaluators, none of the studies cited above can be considered as well established, since many γ-ray remain either unplaced or unconfirmed. Further experiments are recommended to improve knowledge of these decay schemes using state-of-the-art detector systems and better source production methods to avoid large number of impurities present in previous studies.

1983TaZI: ^{129}Ba source formed in three reactions: ^{120}Sn(^{12}C,3n)^{129}Ba, ^{121}Sb(^{12}C,4n)^{129}La followed by ε decay of ^{129}La to ^{129}Ba g.s. and isomer, ^{130}Ba(γ,n). The other two reactions also form both the g.s. and isomer of ^{129}Ba, albeit in different proportions, thus facilitating separation of gamma rays and their intensities into separate decay schemes. Measured Eγ, Iγ, $\gamma\gamma$-coin using two Ge detectors. 1983TaZI is a short note in an annual laboratory report. In July 2011, the evaluators, on communication with T. Tamura (first author of 1983TaZI), were informed that there was no further report or follow-up of this work. work reported in 1983TaZI. Note that many features of the data presented in this short report are common with those in 1973Is04.

1973Is04 (also 1971Is02,1970Is04): mixed (g.s. and isomer) source from ^{133}Cs(p,5n); measured Eγ, Iγ, $\gamma\gamma$ coin with two Ge detectors, ce, ceγ(t) with $\pi\sqrt{2}$ air-core β-ray magnetic spectrometer. In 1971Is02, lifetime of 188-keV level was measured by (ce-L)(γ)(t) method. In 1970Is04, a first detailed decay scheme of ^{129}Ba was proposed with with 15 excited states and 49 γ rays. In 1973Is04, a total of 176 γ rays were reported with 107 γ rays placed in a composite level scheme from both activities, thus no ε,β^{+} feedings and log *ft* values were deduced. Half-lives of the two activities were measured.

1972Ta02: mixed source from ^{130}Ba(γ,n) with dominant activity from ^{129}Ba g.s. decay in contrast to other studies where dominant activity in the source material was from the decay of ^{129}Ba isomer. Measured Eγ, Iγ, $\gamma\gamma$ coin using Ge and NaI(Tl) detector. A total of 118 γ rays reported with 100 placed in a proposed decay scheme of ^{129}Ba. Conversion coefficients were deduced by using γ-ray data from this work and ce data from 1961Ar05. Since a composite decay scheme was proposed for g.s. and isomer decay of ^{129}Ba, no ε,β^{+} feedings and log *ft* values were deduced. Several levels and many placements differ from those in 1983TaZI and 1973Is04. Half-lives of the two activities were measured. Low-spin activity composition in the source material was about four times higher than in the source material used in 1973Is04.

1961Ar05: mixed source. Measured positron spectra, ce data. A total of about 62 transition energies were deduced up to 1624 keV from K-, L- and subshell lines. Another 45 lines in the ce-energy region of 49-1143 keV with half-life of ≈2 h were unassigned. Deduced intensities of three positron branches. Half-lives of most of the observed transitions were measured. No level scheme was proposed, however strong β^{+} branch feeding the g.s. of ^{129}Cs was indicated. Half-lives of the two activities were measured.

Others:

1976Be11: measured lifetime of 6.5-keV level by γ(ce)(t).

1966Li05: measured half-lives of the two activities from γ rays.

1963Ya05: measured half-life of the composite source.

1959He45: measured Eγ, $\beta\gamma$ coin, half-life, eight γ rays reported with a proposed 1450-182 γ cascade.

1950Th08, 1950Fi11: identification and production of ^{129}Ba isotope in proton bombardment of ^{133}Cs.

^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02 (continued)

^{129}Cs Levels

1959He45, based on γγ coincidences proposed a cascade of 182-1450 cascade, establishing levels at 182 and 1632 keV. These are now defined at 189 and 1648 keV, respectively.

In a composite level scheme for g.s. and isomer decay, 1970Is04 (earlier paper from authors of 1973Is04) reported 15 levels at 129,1, 182.3, 202.3, 214.3, 419.8, 595.9, 641.3, 683.8, 748.6, 962.6, 985.3, 1248.7, 1640.8, 1674.5, 1805.2. In their later paper 1971Is02, first excited state was indicates at 6.5 keV. Thus all level energies in in 1970Is04 should be increased upwards by 6.5 keV. A total of 49 transitions were placed amongst these levels.

In a composite level scheme for g.s. and isomer decay, 1972Ta02 report 31 levels at 6.48, 135.6, 188.8, 208.8, 220.8, 426.8, 554.4, 603.6, 648.4, 690.5, 755.3, 969.6, 992.4, 1165.0, 1208.4, 1256.1, 1299.4, 1450.8, 1459.1, 1487.3, 1648.2, 1681.5, 1682.7, 1812.5, 1830.5, 1922.8, 1954.0, 2076.0, 2143.8, 2178.8, 2422.2. Nine of these at 1208.4, 1299.4, 1450.8, 1459.1, 1487.3, 1682.7, 2143.8, 2178.8 and 2422.3 have been omitted here since these are not confirmed in 1983TaZI and 1973Is04. The gamma rays from these levels have either not been confirmed or placed elsewhere in the level schemes based on γγ coin data with two Ge detectors in 1983TaZI and 1973Is04.

In a composite level scheme for g.s. and isomer decay, 1973Is04 report 24 levels at 6.54, 135.5, 188.9, 209.1, 220.8, 426.5, 551.6, 554.9, 575.4, 603.4, 648.4, 690.3, 755.2, 879.1, 969.2, 991.9, 1156.2, 1255.6, 1647.9, 1681.4, 1812.5, 1940.4, 1953.8, 2018.9. All The level scheme for the isomer decay is essentially the same as in 1983TaZI.

1983TaZI report 16 levels populated in the decay of g.s. of ^{129}Ba and 23 levels from the decay of isomer in ^{129}Ba; five low-lying levels amongst these are populated in the decay of both the activities.

E(level)†	J$^{\pi}$‡	$T_{1/2}$‡	Comments
0.0	1/2$^+$	32.06 h *6*	
6.5450 *10*	5/2$^+$	72 ns *6*	$T_{1/2}$: from (129.1-214.3 keV γ)(6.54 ce(M)+ce(N))(t) (1976Be11).
135.56 *7*	3/2$^+$		
188.92 *6*	7/2$^+$	2.26 ns *6*	$T_{1/2}$: from γ(ce)(t) (1973Is04).
208.82 *6*	(5/2)$^+$		
220.85 *6*	3/2$^+$		
426.49 *8*	(9/2)$^+$		
551.58# *15*	(5/2$^+$)		
555.13 *9*	(5/2,7/2)$^+$		
575.44# *14*	(11/2$^-$)	0.718 μs *21*	
603.40 *7*	(7/2$^+$)		
648.46 *8*	(11/2$^+$)		
690.33 *8*	(9/2$^+$)		
755.28 *7*	(5/2,7/2)$^+$		
879.33# *10*	(5/2$^+$,7/2$^+$)		
969.25 *7*	(5/2$^+$,7/2$^+$)		
992.09 *9*	(7/2$^+$,9/2$^+$,11/2$^+$)		
1156.27# *12*	(5/2$^+$,7/2$^+$)		
1255.71 *7*	(5/2$^+$,7/2$^+$)		
1648.04 *6*	(9/2)$^+$		
1681.63 *9*	(5/2$^+$,7/2$^+$,9/2$^+$)		
1812.59 *8*	(9/2)$^+$		
1941.05# *13*	(7/2$^+$,9/2,11/2$^+$)		
2019.15# *19*	(9/2,11/2$^+$)		

† From least-squares fit to Eγ data. The 947.6 doublet γ from 1941 level was omitted in the fitting procedure.
‡ From Adopted Levels unless otherwise stated.
# Level from 1983TaZI and 1973Is04; not reported in 1972Ta02.

^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02 (continued)

ε,β^+ radiations

No log *ft* values are deduced since direct $\varepsilon+\beta^+$ feeding to 6.5-keV level is unknown, as well as possible %IT decay is unknown.

E(decay)	E(level)	Iε †#	I($\varepsilon+\beta^+$) †#
(425 *11*)	2019.15	0.52 *4*	0.52 *4*
(503 *11*)	1941.05	1.5 *1*	1.5 *1*
(632‡ *11*)	1812.59	15.0 *4*	15.0 *4*
(763 *11*)	1681.63	7.2 *3*	7.2 *3*
(796‡ *11*)	1648.04	59.5 *13*	59.5 *13*
(1288 *11*)	1156.27		1.7 *2*
(1475 *11*)	969.25		1.9 *5*
(1565 *11*)	879.33		1.7 *4*
(1689 *11*)	755.28		3.6 *6*
(1754 *11*)	690.33		2.2 *4*
(1796@ *11*)	648.46		1.8 *4*
(1841 *11*)	603.40		3.4 *5*
(1889 *11*)	555.13		2.3 *4*
(1893 *11*)	551.58		3.0 *3*
(2018@ *11*)	426.49		<2

† Only the apparent feedings are given from intensity balance. For some levels there is non-physical negative feeding: −1.3 *6* for 135.56 level, −3.7 *4* for 220.85 level, −1.0 *3* for 992.09 level, and −1.8 *6* for 1255.7 level, implying thereby that level scheme is not known fully.
‡ Most likely an allowed ε transition.
# For absolute intensity per 100 decays, multiply by ≈1.0.
@ Existence of this branch is questionable.

γ(^{129}Cs)

Iγ normalization: 1983TaZI give Iγ=40 as the absolute intensity of 182.3-keV γ ray, assuming the isomer decays 100% by ε decay, and no ε feeding to 6.5-keV level. Both these assumption may not be valid, thus no normalization is carried out here, only apparent ε+β^+ feedings are given from intensity balances.

E_γ ‡	I_γ #	E_i(level)	J^π_i	E_f	J^π_f	Mult. @	δ	α †	$I_{(\gamma+ce)}$	Comments
6.545 *1*		6.5450	5/2$^+$	0.0	1/2$^+$	E2		3.98×10^5 *6*	232 *7*	α(L)=3.15×10^5 *5*; α(M)=6.82×10^4 *10*; α(N)=1.355×10^4 *19*; α(O)=1498 *21*; α(P)=0.373 *6* E_γ: from ce(L2), ce(L3) (1973Is04) measurements relative to the ce(K) line of 182.32 *5* G. $I_{(\gamma+ce)}$: from total Iγ+ce feeding the 6.5-keV level, assuming no direct ε+β^+ feeding. Mult.: L3/L2=1.79 *28*.
53.2 *3*	0.23 *2*	188.92	7/2$^+$	135.56	3/2$^+$	E2		18.6 *5*		α(K)=6.53 *12*; α(L)=9.5 *3*; α(M)=2.08 *7* α(N)=0.419 *13*; α(O)=0.0474 *15*; α(P)=0.000174 *4* Additional information 28. Mult.: L1:L2:L3=14.9 *29*:81.9 *42*:100 *5*. Also E2 from K/L=0.5 (1961Ar05).
73.2 *3*	0.59 *6*	208.82	(5/2)$^+$	135.56	3/2$^+$	M1(+E2)	<0.3	2.35 *16*		α(K)=1.93 *6*; α(L)=0.33 *8*; α(M)=0.069 *17* α(N)=0.014 *4*; α(O)=0.0019 *4*; α(P)=7.45×10^{-5} *14* Additional information 30. Mult.,δ: from α(K)exp=2.1, K/L=5.5 (1961Ar05).
^{x}75.2	0.20 *2*									
85.1 *3*	0.15 *2*	220.85	3/2$^+$	135.56	3/2$^+$	[M1,E2]		2.4 *10*		α(K)=1.6 *4*; α(L)=0.6 *5*; α(M)=0.13 *10* α(N)=0.027 *20*; α(O)=0.0032 *23*; α(P)=5.1×10^{-5} *3* Additional information 32.
^{x}88.6	≤0.1									
^{x}118.3	≤0.1									
^{x}119.7	≤0.1									
129.14 *10*	11.8 *6*	135.56	3/2$^+$	6.5450	5/2$^+$	M1+E2	0.20 *5*	0.449 *10*		α(K)=0.381 *7*; α(L)=0.054 *3*; α(M)=0.0112 *6* α(N)=0.00236 *12*; α(O)=0.000322 *13*; α(P)=1.477×10^{-5} *21* Additional information 26. Mult.: L1:L2:L3=100.0 *26*:13.4 *13*:5.4 *11*. Other: K/L>5.6 (1961Ar05) gives δ(E2/M1)<0.5.
135.61 *20*	1.64 *16*	135.56	3/2$^+$	0.0	1/2$^+$	M1(+E2)	<0.4	0.399 *19*		α(K)=0.336 *11*; α(L)=0.050 *7*; α(M)=0.0103 *15*

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γ(^{129}Cs) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ	α[†]	Comments
									α(N)=0.0022 *3*; α(O)=0.00029 *4*; α(P)=1.290×10^{-5} *20* Additional information 27. Mult.,δ: α(K)exp=0.39, K/L>6.1 (1961Ar05).
^{x}140.1	≤0.1								
^{x}142.8	≤0.1								
^{x}145.5	≤0.1								
149.1 *3*	1.03 *10*	575.44	(11/2$^-$)	426.49	(9/2)$^+$	(E1)		0.0722	α(K)=0.0620 *10*; α(L)=0.00810 *13*; α(M)=0.001647 *25* α(N)=0.000344 *6*; α(O)=4.65×10^{-5} *7*; α(P)=2.03×10^{-6} *3* Additional information 43. Mult.: from Adopted Gammas.
151.9 *3*	0.31 *3*	755.28	(5/2,7/2)$^+$	603.40	(7/2$^+$)	[M1+E2]		0.35 *8*	α(K)=0.28 *4*; α(L)=0.06 *3*; α(M)=0.012 *6* α(N)=0.0026 *12*; α(O)=0.00033 *14*; α(P)=9.50×10^{-6} *21* Additional information 56.
^{x}155.2	≤0.1								
^{x}159.9	≤0.1								
164.6 *3*	0.73 *7*	1812.59	(9/2)$^+$	1648.04	(9/2)$^+$				Additional information 109.
177.02 *10*	7.5 *4*	603.40	(7/2$^+$)	426.49	(9/2)$^+$	(M1)		0.182	α(K)=0.1565 *22*; α(L)=0.0206 *3*; α(M)=0.00422 *6* α(N)=0.000892 *13*; α(O)=0.0001242 *18*; α(P)=6.14×10^{-6} *9* Additional information 46. Mult.: α(K)exp=0.126, K/L=7.0 (1961Ar05).
182.3 *1*	100 *5*	188.92	7/2$^+$	6.5450	5/2$^+$	M1+E2	0.25 *2*	0.1718 *25*	α(K)=0.1463 *21*; α(L)=0.0203 *4*; α(M)=0.00418 *8* α(N)=0.000880 *16*; α(O)=0.0001210 *20*; α(P)=5.65×10^{-6} *8* Additional information 29. E_γ: from ce data in 1973Is04. Mult.: L1:L2:L3=100.0 *9*:9.79 *42*:5.41 *39*. Other: K/L=7.0 (1961Ar05) gives δ(E2/M1)<0.5. δ: 0.32 *5* if penetration effect is included (1973Is04).
^{x}193.7	≤0.15								
202.38 *10*	33.7 *17*	208.82	(5/2)$^+$	6.5450	5/2$^+$	M1(+E2)	0.2 *2*	0.128 *4*	α(K)=0.1094 *23*; α(L)=0.0148 *14*; α(M)=0.0030 *3* α(N)=0.00064 *6*; α(O)=8.8×10^{-5} *7*; α(P)=4.25×10^{-6} *7* Additional information 31. Mult.: L1:L2:L3=100.0 *44*:7.0 *19*:4.5 *16*. Other: K/L=6.9 (1961Ar05) gives δ(E2/M1)<0.7.
214.30 *10*	8.7 *4*	220.85	3/2$^+$	6.5450	5/2$^+$	M1(+E2)	0.5 *5*	0.113 *8*	α(K)=0.095 *4*; α(L)=0.014 *3*; α(M)=0.0029 *7* α(N)=0.00061 *13*; α(O)=8.3×10^{-5} *14*; α(P)=3.59×10^{-6} *11* Additional information 33. Mult.: α(K)exp=0.097 *3*. Other: K/L=6.9 (1961Ar05) gives δ(E2/M1)<0.75.
220.83 *10*	5.7 *3*	220.85	3/2$^+$	0.0	1/2$^+$	M1(+E2)	<0.9	0.104 *5*	α(K)=0.0879 *23*; α(L)=0.0131 *19*; α(M)=0.0027 *4* α(N)=0.00057 *8*; α(O)=7.7×10^{-5} *9*; α(P)=3.30×10^{-6} *9*

γ(^{129}Cs) (continued)

E$_γ$[‡]	I$_γ$[#]	E$_i$(level)	J^π_i	E$_f$	J^π_f	Mult.[@]	α[†]	Comments
								Additional information 34. Mult.,δ: from α(K)exp=0.073, K/L=6.7 (1961Ar05).
[x]225.2	≤0.15							
[x]228.0	≤0.15							
[x]230.4	0.35 *4*							
238.0 *2*	2.9 *3*	426.49	(9/2)$^+$	188.92	7/2$^+$	M1	0.0819	α(K)=0.0704 *10*; α(L)=0.00919 *13*; α(M)=0.00188 *3* α(N)=0.000398 *6*; α(O)=5.54×10^{-5} *8*; α(P)=2.75×10^{-6} *4* Additional information 35. Mult.: K/L=9, α(K)exp=0.098 (1961Ar05); and γ(θ) in in-beam γ ray studies.
[x]243.5	≤0.15							
[x]252.7	≤0.15							
263.9[c] *3*	1.20[c] *12*	690.33	(9/2$^+$)	426.49	(9/2)$^+$	(M1,E2)	0.0641 *21*	α(K)=0.0534 *8*; α(L)=0.0085 *15*; α(M)=0.0018 *4* α(N)=0.00037 *7*; α(O)=4.9×10^{-5} *7*; α(P)=1.93×10^{-6} *16* I$_γ$: total intensity of 1.80 *9* based on branching ratios in Adopted Gammas. Additional information 53. δ: α(K)exp=0.062 (1961Ar05).
263.9[c] *3*	1.05[c] *15*	1255.71	(5/2$^+$,7/2$^+$)	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)			
[x]284.0	0.24 *3*							
286.2 *2*	2.32 *23*	1255.71	(5/2$^+$,7/2$^+$)	969.25	(5/2$^+$,7/2$^+$)	(M1,E2)	0.0504 *8*	α(K)=0.0423 *12*; α(L)=0.0065 *9*; α(M)=0.00135 *21* α(N)=0.00028 *4*; α(O)=3.8×10^{-5} *4*; α(P)=1.54×10^{-6} *15* Additional information 80. Mult.: α(K)exp=0.027 (1961Ar05).
[x]293.0	0.29 *3*					(M1,E2)	0.0471	α(K)=0.0395 *13*; α(L)=0.0060 *8*; α(M)=0.00125 *18* α(N)=0.00026 *4*; α(O)=3.5×10^{-5} *4*; α(P)=1.44×10^{-6} *15* Additional information 1.
[x]297.9	0.29 *3*							
[x]307.2	≤0.15							
[x]324.1	0.51 *5*							
328.4 *3*	0.54 *5*	755.28	(5/2,7/2)$^+$	426.49	(9/2)$^+$	M1,E2	0.0339 *14*	α(K)=0.0286 *17*; α(L)=0.0042 *4*; α(M)=0.00088 *8* α(N)=0.000183 *15*; α(O)=2.47×10^{-5} *12*; α(P)=1.05×10^{-6} *13* Additional information 57. Mult.: α(K)exp=0.027 (1961Ar05).
334.0 *3*	1.06 *11*	555.13	(5/2,7/2)$^+$	220.85	3/2$^+$	M1,E2	0.0323 *14*	α(K)=0.0273 *18*; α(L)=0.0040 *3*; α(M)=0.00083 *7* α(N)=0.000174 *13*; α(O)=2.35×10^{-5} *10*; α(P)=1.00×10^{-6} *13* Additional information 39. Mult.: α(K)exp=0.035 (1961Ar05).
[x]337.8	1.28 *13*					(M1,E2)	0.0313 *15*	α(K)=0.0264 *18*; α(L)=0.0039 *3*; α(M)=0.00080 *7* α(N)=0.000168 *12*; α(O)=2.27×10^{-5} *9*; α(P)=9.7×10^{-7} *13* Additional information 2.

γ(^{129}Cs) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	α[†]	Comments
343.4 *3*	0.26 *3*	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)	648.46	(11/2$^+$)			Additional information 73.
345.3 *3*	0.22 *2*	555.13	(5/2,7/2)$^+$	208.82	(5/2)$^+$			E_γ: poor fit, level-energy difference=346.3. Additional information 40.
354.8[d]		575.44	(11/2$^-$)	220.85	3/2$^+$	[M4]	1.369	α(K)=1.045 *15*; α(L)=0.255 *4*; α(M)=0.0558 *8* α(N)=0.01173 *17*; α(O)=0.001542 *22*; α(P)=5.80×10^{-5} *9* I_γ: 1983TaZI report≤2.7. γ not seen in 1972Ta02 and 1961Ar05. Iγ≤0.15 in 1973Is04. Based on decay data and in-beam γ-ray studies, the evaluators consider this γ ray either non-existent or very weak.
[x]356.4	≤0.15							
366.1[a] *2*	2.15 *22*	555.13	(5/2,7/2)$^+$	188.92	7/2$^+$	M1,E2	0.0250 *17*	α(K)=0.0211 *18*; α(L)=0.00305 *12*; α(M)=0.00063 *3* α(N)=0.000132 *5*; α(O)=1.79×10^{-5} *3*; α(P)=7.8×10^{-7} *11* I_γ: 1.65 from 366 level and 0.50 from 575 level added. Additional information 41. Mult.: α(K)exp=0.026 (1961Ar05).
366.1[ad] *2*		575.44	(11/2$^-$)	208.82	(5/2)$^+$	[E3]	0.0787	α(K)=0.0592 *9*; α(L)=0.01542 *22*; α(M)=0.00331 *5* α(N)=0.000681 *10*; α(O)=8.49×10^{-5} *12*; α(P)=2.09×10^{-6} *3* E_γ,I_γ: this γ is not reported in any of the three in-beam γ-ray studies, even though the 575, (11/2$^-$) isomer is very strongly populated in these studies. It is possible that a small component of 366γ belongs in this location.
[x]376.3	0.75 *8*							
382.9 *3*	0.97 *10*	603.40	(7/2$^+$)	220.85	3/2$^+$			Additional information 47.
[x]384.5	0.30 *3*							
386.7 *3*	0.85 *9*	575.44	(11/2$^-$)	188.92	7/2$^+$	(M2)	0.0862	α(K)=0.0727 *11*; α(L)=0.01073 *16*; α(M)=0.00223 *4* α(N)=0.000471 *7*; α(O)=6.51×10^{-5} *10*; α(P)=3.12×10^{-6} *5* Mult.: α(K)exp=0.116 (1961Ar05). Additional information 44.
392.33 *10*	22.2 *11*	1648.04	(9/2)$^+$	1255.71	(5/2$^+$,7/2$^+$)	(M1)	0.0223	α(K)=0.0192 *3*; α(L)=0.00246 *4*; α(M)=0.000503 *7* α(N)=0.0001064 *15*; α(O)=1.487×10^{-5} *21*; α(P)=7.44×10^{-7} *11* Additional information 85. Mult.: α(K)exp=0.024, K/L=8.0 (1961Ar05).
394.5 *2*	6.5 *3*	603.40	(7/2$^+$)	208.82	(5/2)$^+$			Additional information 48.
[x]407.6	0.70 *7*							
414.0 *2*	4.4 *4*	603.40	(7/2$^+$)	188.92	7/2$^+$			Additional information 49.
416.1 *2*	2.8 *3*	551.58	(5/2$^+$)	135.56	3/2$^+$			Additional information 37.
420.0[c] *2*	22.5[c] *25*	426.49	(9/2)$^+$	6.5450	5/2$^+$	(E2)	0.01548	α(K)=0.01295 *19*; α(L)=0.00201 *3*; α(M)=0.000417 *6*

γ(^{129}Cs) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	α[†]	Comments
								α(N)=8.70×10^{-5} *13*; α(O)=1.157×10^{-5} *17*; α(P)=4.58×10^{-7} *7* I_γ: total Iγ=26.7 *13* divided based on branching ratios in Adopted Gammas. Additional information 36. Mult.: α(K)exp=0.016, K/L=6.4 (1961Ar05).
420.0[c] *2*	4.2[c] *4*	555.13	(5/2,7/2)$^+$	135.56	3/2$^+$			
426.2 *2*	1.55 *16*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	1255.71	(5/2$^+$,7/2$^+$)	(M1)	0.0181	α(K)=0.01556 *22*; α(L)=0.00199 *3*; α(M)=0.000407 *6* α(N)=8.61×10^{-5} *12*; α(O)=1.203×10^{-5} *17*; α(P)=6.03×10^{-7} *9* Additional information 98. Mult.: α(K)exp=0.018 (1961Ar05).
^{x}432.3	0.26 *3*							
^{x}434.5	0.74 *7*					(M1,E2)	0.0156 *16*	α(K)=0.0133 *16*; α(L)=0.00185 *6*; α(M)=0.000381 *9* α(N)=8.00×10^{-5} *23*; α(O)=1.09×10^{-5} *6*; α(P)=5.0×10^{-7} *8* Additional information 3.
437.0 *3*	0.55 *6*	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)	555.13	(5/2,7/2)$^+$			Additional information 74.
^{x}450.1	0.37 *4*							
459.5 *1*	15.7 *8*	648.46	(11/2$^+$)	188.92	7/2$^+$	(E2)	0.01193	α(K)=0.01003 *14*; α(L)=0.001517 *22*; α(M)=0.000314 *5* α(N)=6.55×10^{-5} *10*; α(O)=8.77×10^{-6} *13*; α(P)=3.58×10^{-7} *5* Additional information 52. Mult.: α(K)exp=0.013 gives M1,E2 (1961Ar05).
467.9 *2*	4.9 *5*	603.40	(7/2$^+$)	135.56	3/2$^+$			Additional information 50.
^{x}475.5	0.46 *5*							Additional information 4.
481.4 *1*	9.5 *5*	690.33	(9/2$^+$)	208.82	(5/2)$^+$	(E2)	0.01046	α(K)=0.00881 *13*; α(L)=0.001315 *19*; α(M)=0.000272 *4* α(N)=5.68×10^{-5} *8*; α(O)=7.62×10^{-6} *11*; α(P)=3.16×10^{-7} *5* Additional information 54. Mult.: α(K)exp=0.016, K/L=6.3 (1961Ar05).
491.8 *3*	0.88 *9*	1648.04	(9/2)$^+$	1156.27	(5/2$^+$,7/2$^+$)			Additional information 86.
501.4 *1*	6.8 *3*	690.33	(9/2$^+$)	188.92	7/2$^+$	(M1)	0.01203	α(K)=0.01037 *15*; α(L)=0.001322 *19*; α(M)=0.000270 *4* α(N)=5.70×10^{-5} *8*; α(O)=7.98×10^{-6} *12*; α(P)=4.01×10^{-7} *6* Additional information 55. Mult.: α(K)exp=0.013 (1961Ar05).
^{x}517.6	0.48 *5*							
^{x}519.6	0.53 *5*							
525.3 *3*	1.03 *10*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	1156.27	(5/2$^+$,7/2$^+$)			Additional information 99.
^{x}528.5	0.86 *9*							Additional information 5.
534.4 *2*	3.3 *3*	755.28	(5/2,7/2)$^+$	220.85	3/2$^+$	(M1)	0.01028	α(K)=0.00886 *13*; α(L)=0.001127 *16*; α(M)=0.000230 *4* α(N)=4.86×10^{-5} *7*; α(O)=6.80×10^{-6} *10*; α(P)=3.42×10^{-7} *5* Additional information 58. Mult.: α(K)exp=0.011 (1961Ar05).
542.9 *2*	3.9 *4*	969.25	(5/2$^+$,7/2$^+$)	426.49	(9/2)$^+$	(M1,E2)	0.0087 *12*	α(K)=0.0074 *11*; α(L)=0.00100 *9*; α(M)=0.000205 *16* α(N)=4.3×10^{-5} *4*; α(O)=6.0×10^{-6} *6*; α(P)=2.8×10^{-7} *5* Additional information 68. Mult.: α(K)exp=0.013 (1961Ar05).

$^{129}_{55}Cs_{74}$-8

γ(^{129}Cs) (continued)

E_γ‡	I_γ#	E_i(level)	J_i^π	E_f	J_f^π	Mult.@	α†	Comments
546.6 *1*	11.6 *6*	755.28	(5/2,7/2)$^+$	208.82	(5/2)$^+$	(M1)	0.00972	α(K)=0.00839 *12*; α(L)=0.001066 *15*; α(M)=0.000217 *3* α(N)=4.60×10^{-5} *7*; α(O)=6.43×10^{-6} *9*; α(P)=3.24×10^{-7} *5* Additional information 59. Mult.: α(K)exp=0.014, K/L=8 (1961Ar05).
549.0 *2*	4.6 *5*	555.13	(5/2,7/2)$^+$	6.5450	5/2$^+$			Additional information 42.
551.5 *2*	4.6 *5*	551.58	(5/2$^+$)	0.0	1/2$^+$			Additional information 38.
556.9 *2*	3.3 *3*	1812.59	(9/2)$^+$	1255.71	(5/2$^+$,7/2$^+$)			Additional information 110.
566.21 *10*	7.6 *4*	755.28	(5/2,7/2)$^+$	188.92	7/2$^+$			Additional information 60.
569.2 *3*	≈0.10	575.44	(11/2$^-$)	6.5450	5/2$^+$	[E3]	0.01751	α(K)=0.01419 *20*; α(L)=0.00264 *4*; α(M)=0.000554 *8* α(N)=0.0001153 *17*; α(O)=1.506×10^{-5} *22*; α(P)=5.29×10^{-7} *8* I_γ: from branching in-beam γ-ray study (1977Ch23), where this γ is seen very weakly with only 7% branching ratio, consistent with its high multipolarity. In 1983TaZI, with Iγ=1.19, branching is 34%. In 1972Ta02 this γ was not placed. Main component of this γ ray must belong somewhere else. Additional information 45.
^{x}577.9	≤0.15							
^{x}589.8	0.70 *7*							
596.78 *20*	5.3 *5*	603.40	(7/2$^+$)	6.5450	5/2$^+$	(M1,E2)	0.0068 *10*	α(K)=0.0059 *9*; α(L)=0.00078 *8*; α(M)=0.000160 *16* α(N)=3.4×10^{-5} *4*; α(O)=4.6×10^{-6} *6*; α(P)=2.2×10^{-7} *4* Additional information 51. Mult.: α(K)exp=0.0106, K/L=6 (1961Ar05).
601.0 *3*	0.60 *6*	1156.27	(5/2$^+$,7/2$^+$)	555.13	(5/2,7/2)$^+$			Additional information 76.
^{x}606.3	0.40 *4*							
^{x}610.0	0.06 *1*							
^{x}614.9	0.55 *6*							
619.8 *3*	0.75 *8*	755.28	(5/2,7/2)$^+$	135.56	3/2$^+$			Additional information 61.
^{x}628.0	0.31 *3*							
^{x}631.3	0.38 *4*							
656.2 *2*	3.8 *4*	1648.04	(9/2)$^+$	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)			Additional information 87.
658.9 *3*	0.82 *8*	879.33	(5/2$^+$,7/2$^+$)	220.85	3/2$^+$			Additional information 63.
^{x}660.7	0.31 *3*							
670.4 *3*	0.83 *8*	879.33	(5/2$^+$,7/2$^+$)	208.82	(5/2)$^+$			Additional information 64.
^{x}670.8& *7*	0.68 *7*							
678.8 *1*	13.8 *7*	1648.04	(9/2)$^+$	969.25	(5/2$^+$,7/2$^+$)	(M1)	0.00574	α(K)=0.00496 *7*; α(L)=0.000626 *9*; α(M)=0.0001275 *18* α(N)=2.70×10^{-5} *4*; α(O)=3.78×10^{-6} *6*; α(P)=1.91×10^{-7} *3* Additional information 88. Mult.: α(K)exp=0.0075, K/L=6.5 (1961Ar05).
^{x}684.4 *7*	0.65 *7*							Additional information 6.

γ(^{129}Cs) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	Comments
^{x}685.7	0.76 *8*						
689.2 *2*	4.2 *4*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)		Additional information 100.
690.3 *2*	4.2 *4*	879.33	(5/2$^+$,7/2$^+$)	188.92	7/2$^+$		Additional information 65.
^{x}698.8	0.29 *3*						
700.6 *2*	2.7 *3*	1255.71	(5/2$^+$,7/2$^+$)	555.13	(5/2,7/2)$^+$		Additional information 81.
^{x}706.0	0.51 *5*						
712.1 *2*	2.9 *3*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	969.25	(5/2$^+$,7/2$^+$)		Additional information 101.
^{x}713.5	0.31 *3*						
730.2 *3*		1156.27	(5/2$^+$,7/2$^+$)	426.49	(9/2)$^+$		Additional information 77.
^{x}737.9	0.53 *5*						Additional information 7.
744.4 *3*	0.45 *5*	879.33	(5/2$^+$,7/2$^+$)	135.56	3/2$^+$		Additional information 66.
748.5[b] *2*	6.9[b] *3*	755.28	(5/2,7/2)$^+$	6.5450	5/2$^+$	(M1,E2)	Additional information 62. E_γ: placement from 1972Ta02 and 1973Is04; not given in level-scheme figure 1 of 1983TaZI. Mult.: α(K)exp=0.0064 (1961Ar05).
748.5[b] *2*	6.9[b] *3*	969.25	(5/2$^+$,7/2$^+$)	220.85	3/2$^+$		
759.9 *2*	1.33 *13*	969.25	(5/2$^+$,7/2$^+$)	208.82	(5/2)$^+$		Additional information 69.
^{x}761.7	0.20 *2*						
^{x}766.4	0.31 *3*						
768.8 *2*	2.95 *30*	1648.04	(9/2)$^+$	879.33	(5/2$^+$,7/2$^+$)	(M1)	Additional information 89. Mult.: α(K)exp=0.0053 (1961Ar05).
^{x}776.4	0.32 *3*						Additional information 8.
780.4 *2*	6.4 *3*	969.25	(5/2$^+$,7/2$^+$)	188.92	7/2$^+$		Additional information 70.
^{x}783.1	1.33 *13*						Additional information 9.
^{x}789.2	$\leq$0.1						
^{x}792.1	$\leq$0.1						
^{x}793.4	$\leq$0.1						
803.2 *1*	8.5 *4*	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)	188.92	7/2$^+$	(M1,E2)	Additional information 75. Mult.: α(K)exp=0.0051 (1961Ar05).
^{x}805.2	0.61 *6*						Additional information 10.
^{x}816.3	0.59 *6*						
^{x}818.4	0.64 *6*						
820.5 *2*	2.8 *3*	1812.59	(9/2)$^+$	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)		Additional information 111.
^{x}822.7	0.33 *3*						
^{x}826.6	0.11 *1*						
828.9 *3*	1.07 *11*	1255.71	(5/2$^+$,7/2$^+$)	426.49	(9/2)$^+$		Additional information 82.
833.5 *2*	2.6 *3*	969.25	(5/2$^+$,7/2$^+$)	135.56	3/2$^+$		Additional information 71.
^{x}869.1	0.51 *5*						
872.5 *2*	5.3 *5*	879.33	(5/2$^+$,7/2$^+$)	6.5450	5/2$^+$	(M1,E2)	Additional information 67. Mult.: α(K)exp=0.0041 (1961Ar05).
^{x}883.2	0.56 *6*						Additional information 11.
892.6 *1*	21.2 *11*	1648.04	(9/2)$^+$	755.28	(5/2,7/2)$^+$	(M1)	Additional information 90. Mult.: α(K)exp=0.0032, K/L=6.4 (1961Ar05).

γ(^{129}Cs) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]	Comments
[x]911.1	0.30 3						
[x]923.8[&] 4	0.45 5						
927.0 3	1.26 13	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	755.28	(5/2,7/2)$^+$		Additional information 102.
933.2 2	4.5 5	1812.59	(9/2)$^+$	879.33	(5/2$^+$,7/2$^+$)		Additional information 112.
935.2 2	4.5 5	1156.27	(5/2$^+$,7/2$^+$)	220.85	3/2$^+$		Additional information 78.
947.6[b] 3	0.96[b] 10	1156.27	(5/2$^+$,7/2$^+$)	208.82	(5/2)$^+$		Additional information 79.
947.6[b] 3	0.96[b] 10	1941.05	(7/2$^+$,9/2,11/2$^+$)	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)		E_γ: poor fit, level-energy difference=948.7. Additional information 121.
[x]955.4	0.93 9						
957.5 2	4.1 4	1648.04	(9/2)$^+$	690.33	(9/2$^+$)		Additional information 91.
962.6 2	2.8 3	969.25	(5/2$^+$,7/2$^+$)	6.5450	5/2$^+$		Additional information 72.
[x]970.7[&] 7	0.28 3						Additional information 12.
991.3 2	1.62 16	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	690.33	(9/2$^+$)		Additional information 103.
999.5 1	7.8 4	1648.04	(9/2)$^+$	648.46	(11/2$^+$)		Additional information 92.
[x]1019.3[&] 4	0.45 5						Additional information 13.
1026.1[d] 3	0.25 3	2019.15	(9/2,11/2$^+$)	992.09	(7/2$^+$,9/2$^+$,11/2$^+$)		E_γ: γ reported only in 1973Is04.
1034.8 1	8.1 4	1255.71	(5/2$^+$,7/2$^+$)	220.85	3/2$^+$	(M1,E2)	Additional information 83. Mult.: α(K)exp=0.0024, K/L=7.4 (1961Ar05).
1044.7 1	13.8 7	1648.04	(9/2)$^+$	603.40	(7/2$^+$)		Additional information 93.
1047.1 1	7.8 4	1255.71	(5/2$^+$,7/2$^+$)	208.82	(5/2)$^+$		E_γ: from 1973Is04; large uncertainty of 0.6 keV in 1972Ta02. Additional information 84.
[x]1051.2	0.40 4						
1072.8 3	0.75 8	1648.04	(9/2)$^+$	575.44	(11/2$^-$)		Additional information 94.
1077.7 3	1.40 14	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	603.40	(7/2$^+$)		Additional information 104.
[x]1080.7[&] 5	0.37 4						
[x]1112.0[&] 5	0.48 5						
[x]1115.5	0.95 10						Additional information 14.
1122.3 2	5.2 3	1812.59	(9/2)$^+$	690.33	(9/2$^+$)		Additional information 113.
1126.7 2	2.6 3	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	555.13	(5/2,7/2)$^+$		Additional information 105.
1164.4 3	0.99 10	1812.59	(9/2)$^+$	648.46	(11/2$^+$)		Additional information 114.
[x]1180.2	1.00 10						Additional information 15.
[x]1181.8[&] 5	0.56 6						Additional information 16.
1209.1 2	6.7 3	1812.59	(9/2)$^+$	603.40	(7/2$^+$)		Additional information 115.
1221.7 2	6.4 3	1648.04	(9/2)$^+$	426.49	(9/2)$^+$		Additional information 95. Mult.: α(K)exp=0.0016 (1961Ar05).
1237.3 3	0.79 8	1812.59	(9/2)$^+$	575.44	(11/2$^-$)		Additional information 116.
1250.5 2	1.27 13	1941.05	(7/2$^+$,9/2,11/2$^+$)	690.33	(9/2$^+$)		Additional information 122.
[x]1255.6[&] 4	0.56 6						Additional information 17.
[x]1266.4[&] 4	0.31 3						Additional information 18.
[x]1286.0	0.77 8						Additional information 19.
1292.8 2	1.66 17	1941.05	(7/2$^+$,9/2,11/2$^+$)	648.46	(11/2$^+$)		Additional information 123.

γ(^{129}Cs) (continued)

E_γ [‡]	I_γ [#]	E_i(level)	J^π_i	E_f	J^π_f	Comments
[x]1295.4[&] *4*	0.40 *4*					
[x]1302.9	0.55 *6*					Additional information 20.
1370.4 *3*	0.69 *7*	2019.15	(9/2,11/2$^+$)	648.46	(11/2$^+$)	Additional information 125.
1385.7 *3*	0.58 *6*	1812.59	(9/2)$^+$	426.49	(9/2)$^+$	Additional information 117.
[x]1421.6[&] *4*	0.28 *3*					
[x]1429.6[&] *6*	0.13 *2*					Additional information 21.
1444.0 *3*	0.57 *6*	2019.15	(9/2,11/2$^+$)	575.44	(11/2$^-$)	Additional information 126.
1459.2 *1*	50.0 *25*	1648.04	(9/2)$^+$	188.92	7/2$^+$	Additional information 96. Mult.: from α(K)exp=4×10^{-4} *1* (in figure 7 of 1973Is04) suggests E1, but (M1,E2) from α(K)exp=0.0013 and K/L=6.3 (1961Ar05).
1473.3 *3*	0.73 *7*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	208.82	(5/2)$^+$	Additional information 106.
1492.4 *3*	0.49 *5*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	188.92	7/2$^+$	Additional information 107.
[x]1553.2	0.22 *2*					
1604.0 *3*	0.31 *3*	1812.59	(9/2)$^+$	208.82	(5/2)$^+$	Additional information 118.
1623.7 *1*	11.0 *6*	1812.59	(9/2)$^+$	188.92	7/2$^+$	Additional information 119.
1641.1 *3*	1.04 *10*	1648.04	(9/2)$^+$	6.5450	5/2$^+$	Additional information 97.
1675.1 *3*	0.29 *3*	1681.63	(5/2$^+$,7/2$^+$,9/2$^+$)	6.5450	5/2$^+$	Additional information 108.
1752.1 *3*	0.74 *7*	1941.05	(7/2$^+$,9/2,11/2$^+$)	188.92	7/2$^+$	Additional information 124.
1805.5 *3*	0.60 *6*	1812.59	(9/2)$^+$	6.5450	5/2$^+$	Additional information 120.
[x]1810.1[&] *4*	0.20 *2*					
1830.2 *3*	0.03 *1*	2019.15	(9/2,11/2$^+$)	188.92	7/2$^+$	Additional information 127.
[x]1890.7	≤0.15					
[x]1934.9[&] *5*	0.14 *2*					Additional information 22.
[x]1969.6[&] *3*	0.17 *2*					Additional information 23.
[x]2069.7[&] *3*	0.28 *3*					Additional information 24.
[x]2287.1[&] *10*	0.08 *1*					Additional information 25.

[†] Overlaps M1 and E2 values for M1+E2, or M1,E2 transitions.

[‡] From unweighted average of values from 1972Ta02 and 1973Is04 (or 1983TaZI). Uncertainties are provided only by 1972Ta02. In 1983TaZI, most energies are the same as in 1973Is04. Based on comparison of values in three studies, evaluators assign the uncertainties as follows: Δ(Eγ)=0.10 keV for Iγ≥3%, 0.20 keV for Iγ=0.5-3%, and 0.3 keV or Iγ<0.5%. Document records in the ENSDF database provide compiled Eγ values from 1973Is04, 1972Ta02, and 1961Ar05. Unplaced γ rays are from 1973Is04, unless otherwise stated.

[#] Values are from 1983TaZI relative to 100 for 182.3γ, i.e. each value in 1983TaZI is multiplied by a factor of 2.5. 1983TaZI quoted absolute intensities but lack of knowledge about direct ε feeding to 6.5-keV, 5/2$^+$ level does not allow normalization of the decay scheme. Uncertainties are not given by 1983TaZI. The evaluators assign the uncertainties as follows: Δ(Iγ)=5% for Iγ≥5, 10% for Iγ<5. There is in general poor agreement of intensities listed by 1983TaZI, 1973Is04 and 1972Ta02; with factor of 2 difference in many cases. Values are adopted here from 1983TaZI, since they probably used more efficient Ge detectors resulting in better statistics. Document records in the ENSDF database provide compiled Iγ data from 1973Is04 and 1972Ta02, and Ice(K), K/L ratios from 1961Ar05.

γ(^{129}Cs) (continued)

@ From 1973Is04, unless otherwise noted. Values α(K)exp, K/L and L-subshell ratios are from private communication to evaluator of 1996Te01 from 1973Is04. Other multipolarities are deduced by evaluators of current evaluation using Iγ values from 1973Is04 and Ice(K) and/or K/L ratios from 1961Ar05. For γ rays above 400 keV or so, such assignments are tentative since the agreement between deduced α(K)exp values and theoretical values from BrIcc code is poor.

& This γ from 1972Ta02 only.

[a] Multiply placed.

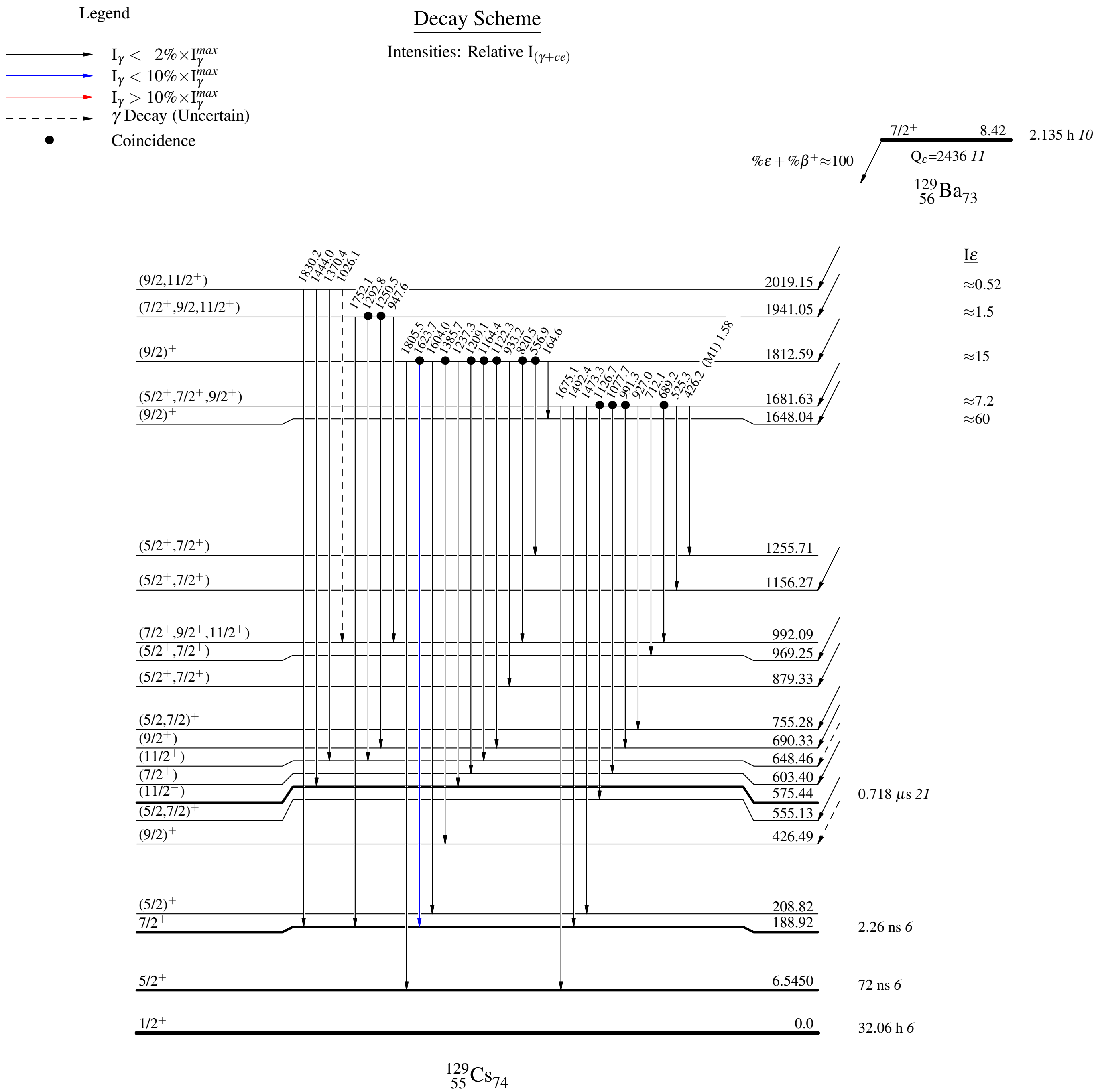
[b] Multiply placed with undivided intensity.

[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.

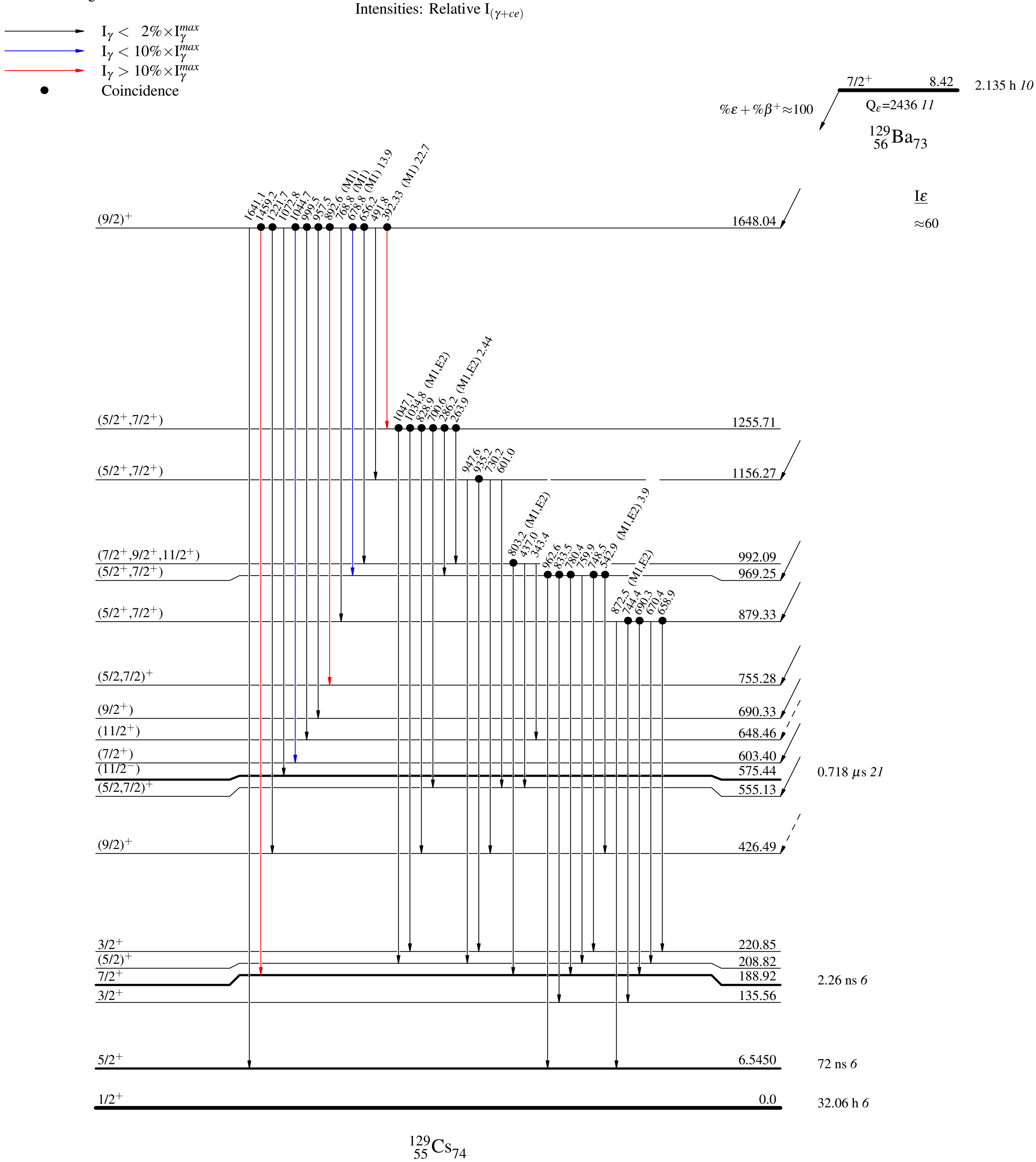
^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02



^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02

Decay Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$

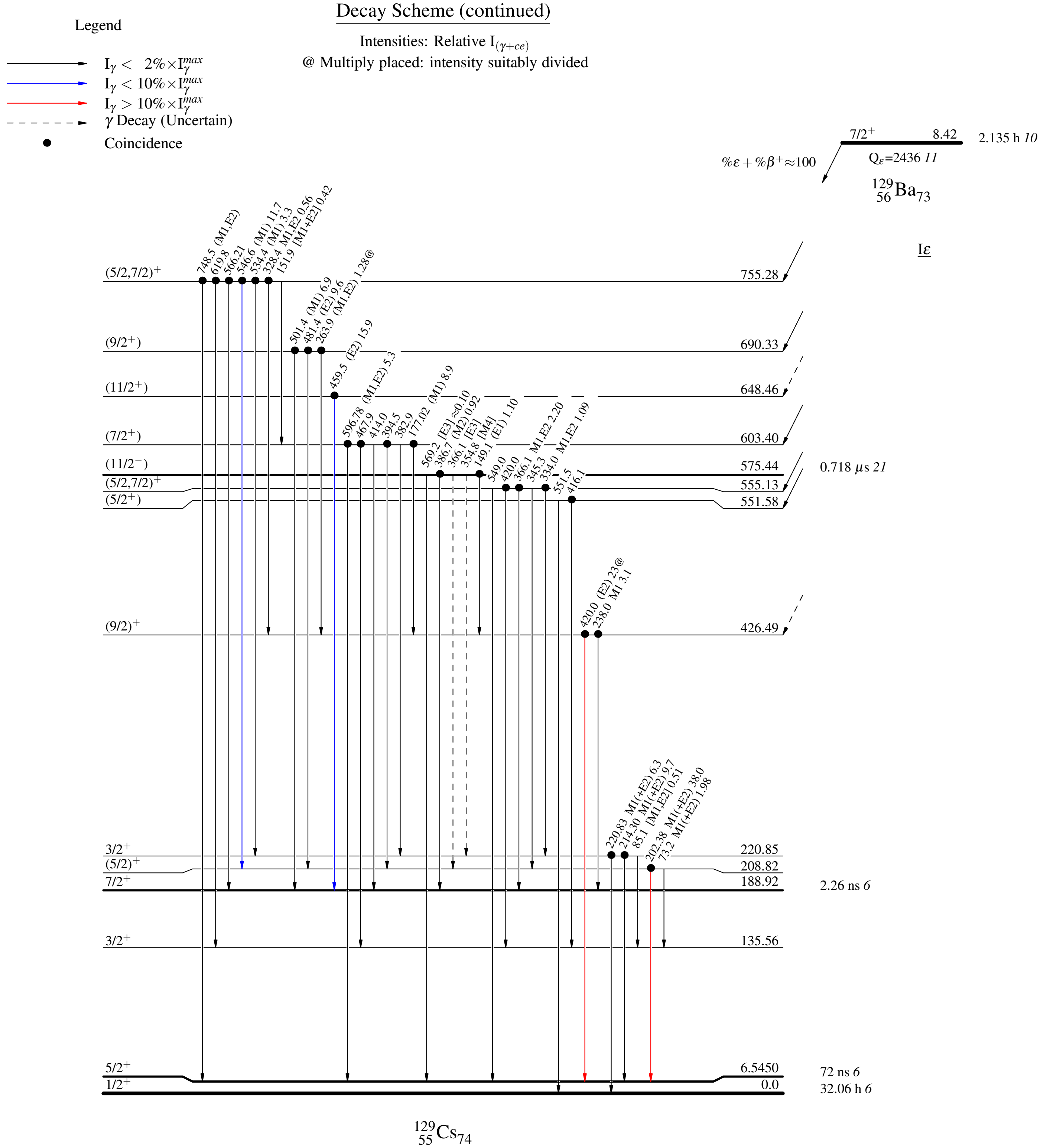


^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02

Decay Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$

@ Multiply placed: intensity suitably divided



^{129}Ba ε decay (2.135 h) 1983TaZI,1973Is04,1972Ta02

Decay Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$

@ Multiply placed: intensity suitably divided

Legend