^{136}I β^- decay (83.4 s) 1977We04,1991Ma07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 152, 331 (2018)	1-Apr-2018

Parent: ^{136}I: E=0.0; J$^\pi$=(1$^-$); $T_{1/2}$=83.4 s *4*; Q(β^-)=6884 *14*; %β^- decay=100.0

1991Ma07: ^{136}I activity from ^{235}U(n,F) with E=thermal followed by mass separation (TRISTAN). Measured Eγ, Iγ, Ece, Ice using a Ge detector and a Si(Li) detector; deduced conversion coefficients.

1977We04: ^{136}I activity from ^{235}U(n,F) followed by mass separation at the TRISTAN on-line isotope separator facility at the Ames reserach reactor. Measured Eγ, Iγ, γ(t), $\gamma\gamma$ using two Ge(Li) detectors.

1980KeZQ: ^{136}I activity from ^{235}U(n,F) with E=thermal followed by mass separation (LOHENGRIN). Measured Eγ, Eβ, β-γ coincidences using plastic scintillator telescope amd Ge(Li) detector; deduced β end point energies.

1959Jo37: U(n,F), chemistry. Measured γ's and $\gamma\gamma$ (NaI) and β's and $\beta\gamma$ (anthracene).

Others: 1982Al01, 1974Bu28.

Decay scheme is from 1977We04 with some modifications as proposed by 1979Pe02 (since 1583.5γ and 597.8γ have only a 83.4-s component and 2178.4γ only a 46.6-s component, 1979Pe02 proposed that the 3873 level is a doublet). 1991Ma07 have introduced 0$^+$ levels at 2582 and 3420 based upon observed E0 transitions. They also do not show feeding of 2608 level in g.s. decay. 1977We04 present a composite decay scheme; for clarity the data are presented here as three separate schemes, for 83.4-s, 46.6-s, and 83.4-s + 46.6-s decay. The latter tables and drawing contain those transitions which could not be classified as belonging to either the 83.4-s or the 46.6-s decay.

A total energy release of 6900 keV *110* as calculated by the code RADLST, is in good agreement with the total available energy of the decay of 6884 keV *14*.

α: Additional information 1.

^{136}Xe Levels

E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡
0.0	0$^+$	2979.11 *22*	1$^+$,2$^+$	5016.99 *21*	(1,2$^+$)	6103.9? *3*	1$^-$
1313.028 *10*	2$^+$	3211.90 *20*	(1,2$^+$)	5217.8 *4*		6114.5? *7*	1
1694.387 *12*	4$^+$	3275.22 *13*	3$^-$	5321.06? *24*	(1$^+$,2$^+$)	6126.4? *5*	1
2125.70 *6*	3$^+$,4$^+$	3873.13 *14*	(3$^-$)	5608.1? *4*	1	6169.9? *8*	(1,2$^+$)
2289.53 *8*	2$^+$	4269.33 *9*	2$^{(+)}$	5760.2 *3*		6200.1? *13*	(1,2$^+$)
2414.74 *11*	2$^+$	4320.1? *10*	0$^+$	5800.1? *3*	1	6253.5? *8*	1
2559.88 *7*	(4$^+$)	4454.07 *16*	1$^{(-)}$,2$^{(+)}$	5832.2? *6*	(2$^+$,3,4$^+$)	6409.0? *8*	(1,2$^+$)
2582.4 *10*	0$^+$	4474.05? *22*	1	5870.8? *12*	1	6624.07 *18*	
2634.16 *7*	1$^+$,2$^+$	4545.0 *3*	1,2$^{(+)}$	5968.5? *10*	(1,2$^+$)		
2849.41 *9*	(1,2$^+$)	4711.2 *4*	1	6013.0? *10*	(1,2$^+$)		
2869.00 *10*	(2$^+$)	4947.5 *3*		6052.6? *4*	(1,2$^+$)		

† From a least-squares fit to Eγ, by evaluator.
‡ From the Adopted Levels.

β^- radiations

No decomposition of singles spectrum into components possible due to presence of several strong ≈5−MeV β's in the decay of the two isomers (1980KeZQ).

<Eβ>=1.97 MeV *8* from 1982Al01 (OSIRIS; Si(Li),Ge(Li)) compares favorably with <Eβ>=1.96 MeV *6* from the decay scheme.

Level	Eβ ($\beta\gamma$ coin)†
g.s.	7000 *100* (1959Jo37), 6955 *120*
1313	5620 *150* (singles), 5600 *150* (1.32-MeV γ) (1959Jo37)
2290	4735 *180* (977γ), 4635 *180* (2290γ)
2634	4300 *150* (singles), 4230 *200* (1.32-MeV γ) (1959Jo37); 4240 *210* (345γ), 4305 *180* (1313γ+1321γ), 4165 *210* (2634γ)

† From 1980KeZQ, except as noted

E(decay)	E(level)	Iβ⁻[#]	Log *ft*	Comments
(260 *14*)	6624.07	0.55 *4*	3.71 *9*	av Eβ=73.1 *44*
(475[@] *14*)	6409.0?	0.045 *14*	5.66 *15*	av Eβ=144.4 *50*
(631[@] *14*)	6253.5?	0.033 *10*	6.21 *14*	av Eβ=200.5 *53*
(684[@] *14*)	6200.1?	0.011 *6*	6.82 *24*	av Eβ=220.5 *54*
(714[@] *14*)	6169.9?	0.014 *4*	6.78 *13*	av Eβ=232.0 *54*
(758[@] *14*)	6126.4?	0.09 *3*	6.06 *15*	av Eβ=248.7 *55*
(770[@] *14*)	6114.5?	0.067 *20*	6.21 *14*	av Eβ=253.3 *55*
(780[@] *14*)	6103.9?	0.23 *3*	5.70 *7*	av Eβ=257.4 *55*
(831[@] *14*)	6052.6?	0.16 *2*	5.95 *6*	av Eβ=277.5 *56*
(871[@] *14*)	6013.0?	0.015 *12*	7.1 *4*	av Eβ=293.1 *56*
(916[@] *14*)	5968.5?	0.14 *12*	6.2 *4*	av Eβ=310.9 *57*
(1013[@] *14*)	5870.8?	0.027 *20*	7.0 *4*	av Eβ=350.5 *58*
(1052[@] *14*)	5832.2?	0.10 *3*	6.53 *14*	av Eβ=366.3 *58*
(1084[@] *14*)	5800.1?	0.29 *3*	6.12 *5*	av Eβ=379.5 *58*
(1124 *14*)	5760.2	0.25 *3*	6.24 *6*	av Eβ=396.1 *59*
(1276[@] *14*)	5608.1?	0.15 *4*	6.67 *12*	av Eβ=460.0 *60*
(1563[@] *14*)	5321.06?	0.24 *3*	6.80 *6*	av Eβ=584.0 *62*
(1666[@] *14*)	5217.8	0.12 *2*	7.21 *8*	av Eβ=629.3 *62*
(1867 *14*)	5016.99	0.50 *9*	6.79 *8*	av Eβ=718.5 *63*
(1937 *14*)	4947.5	0.38 *4*	6.97 *5*	av Eβ=749.7 *63*
(2173[@] *14*)	4711.2	0.053 *14*	8.03 *12*	av Eβ=856.4 *64*
(2339 *14*)	4545.0	0.15 *3*	7.71 *9*	av Eβ=932.0 *64*
(2410[@] *14*)	4474.05?	0.37 *4*	7.37 *5*	av Eβ=964.5 *65*
(2430 *14*)	4454.07	1.33 *7*	6.83 *3*	av Eβ=973.6 *65*
(2615 *14*)	4269.33	4.71 *16*	6.407 *19*	av Eβ=1058.5 *65*
(3011 *14*)	3873.13	0.19 *8*	8.06 *19*	av Eβ=1241.8 *65*
(3672 *14*)	3211.90	0.23 *7*	8.34 *14*	av Eβ=1550.2 *66*
(3905 *14*)	2979.11	0.31 *5*	8.32 *7*	av Eβ=1659.3 *66*
(4015 *14*)	2869.00	4.6 *4*	7.20 *4*	av Eβ=1711.0 *66* E(decay): other: 4060 *120* (1980KeZQ).
(4035 *14*)	2849.41	0.86 *11*	7.94 *6*	av Eβ=1720.2 *66*
(4250 *14*)	2634.16	34[†] *2*	6.44 *3*	av Eβ=1821.3 *66* E(decay): other: see table above.
(4302 *14*)	2582.4	≈0.1	≈9.0	av Eβ=1845.6 *66* Iβ⁻: from I(ce) (1991Ma07).
(4324 *14*)	2559.88	2.5 *2*	7.61 *4*	av Eβ=1856.2 *66* Log *ft*: inconsistent with ΔJ=3 transition and possibily indicates unobserved feeding to this level.
(4469 *14*)	2414.74	6.0 *4*	7.29 *3*	av Eβ=1924.5 *66* E(decay): other: 4570 *180* (1980KeZQ).
(4594 *14*)	2289.53	9.9 *7*	7.12 *4*	av Eβ=1983.4 *66* E(decay): other: see table above.
(5571 *14*)	1313.028	28.8[†] *19*	7.03 *3*	av Eβ=2443.3 *66* E(decay): other: see table above.
(6884 *14*)	0.0	≈3[‡]	≈8.4	av Eβ=3061.7 *66* E(decay): other: see table above.

† I(≤4.3−MeV β)/I(5.62-MeV β)=3.6 (1959Jo37) compared to 1.47 *11* derived from the decay scheme.
‡ From I(5.6-MeV β) and I(7.0-MeV β)/I(5.6-MeV β)=0.1 (1959Jo37). Evaluator considers this ratio to be approximate due to the

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^{136}I β^- decay (83.4 s) 1977We04,1991Ma07 (continued)

β^- radiations (continued)

presence of several strong ≈5−MeV β's in the decay of the two isomers.
[#] Absolute intensity per 100 decays.
[@] Existence of this branch is questionable.

$\gamma(^{136}Xe)$

Iγ normalization: from ΣI(γ+ce)(to g.s.)+Iβ(g.s.)=100 with assumption of a 50% uncertainty in Iβ(g.s.) (evaluator) and including tentatively placed transitions. If tentative transitions are excluded, the normalization becomes 0.0674 *12*.

E_γ[†]	I_γ[†#a]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α	Comments
219.33 *15*	12.3 *10*	2634.16	1$^+$,2$^+$	2414.74	2$^+$	not E1		α(K)exp=0.174 *44* (1991Ma07) Mult.: from α(K)exp.
270.2 *3*	3.1 *8*	2559.88	(4$^+$)	2289.53	2$^+$			
309.1 *2*	5.1 *5*	2869.00	(2$^+$)	2559.88	(4$^+$)			
344.72 *10*	36 *3*	2634.16	1$^+$,2$^+$	2289.53	2$^+$	M1+E2	0.0277 *9*	α(K)exp=0.022 *4* (1991Ma07) α(K)=0.0235 *11*; α(L)=0.0034 *3*; α(M)=0.00069 *6*; α(N)=0.000142 *11*; α(O)=1.71×10^{-5} *7* Mult.: from α(K)exp.
362.5 *4*	1.9 *3*	3211.90	(1,2$^+$)	2849.41	(1,2$^+$)			
(381.359[@] *7*)	14.0[@] *13*	1694.387	4$^+$	1313.028	2$^+$	E2	0.0198	α(K)=0.01652 *24*; α(L)=0.00259 *4*; α(M)=0.000532 *8*; α(N)=0.0001085 *16* α(O)=1.274×10^{-5} *18*
396.0 *2*	6.4 *8*	4269.33	2$^{(+)}$	3873.13	(3$^-$)			
431.38 *12*	3.0 *10*	2125.70	3$^+$,4$^+$	1694.387	4$^+$			
434.18 *11*	11.9 *9*	2559.88	(4$^+$)	2125.70	3$^+$,4$^+$			
597.8 *2*	5.4 *6*	3873.13	(3$^-$)	3275.22	3$^-$			
812.63 *8*	13 *4*	2125.70	3$^+$,4$^+$	1313.028	2$^+$			
865.5 *3*	9.6 *8*	2559.88	(4$^+$)	1694.387	4$^+$			
976.5 *2*	40 *3*	2289.53	2$^+$	1313.028	2$^+$			
994.2 *2*	24.2 *13*	4269.33	2$^{(+)}$	3275.22	3$^-$			
1057.4 *4*	4.3 *7*	4269.33	2$^{(+)}$	3211.90	(1,2$^+$)			
1101.4 *3*	7.2 *11*	2414.74	2$^+$	1313.028	2$^+$			
1178.6 *3*	3.3 *5*	4454.07	1$^{(-)}$,2$^{(+)}$	3275.22	3$^-$			
1246.84 *10*	34.0 *18*	2559.88	(4$^+$)	1313.028	2$^+$			
1313.02 *1*	1000	1313.028	2$^+$	0.0	0$^+$			
1321.08 *10*	372 *26*	2634.16	1$^+$,2$^+$	1313.028	2$^+$	M1(+E2)	0.00105 *12*	α(K)exp=0.00097 *22* (1991Ma07) α(K)=0.00089 *11*; α(L)=0.000110 *12*; α(M)=2.21×10^{-5} *25*; α(N)=4.6×10^{-6} *5*; α(O)=5.7×10^{-7} *7* Mult.: from α(K)exp.
1399.9 *5*	1.6 *4*	4269.33	2$^{(+)}$	2869.00	(2$^+$)			
1536.4 *1*	19.4 *11*	2849.41	(1,2$^+$)	1313.028	2$^+$			
1555.97 *15*	7.0 *5*	2869.00	(2$^+$)	1313.028	2$^+$			
1583.5 *2*	3.8 *5*	3873.13	(3$^-$)	2289.53	2$^+$			
1624.8[c] *3*	3.5 *5*	4474.05?	1	2849.41	(1,2$^+$)			
1635.2 *2*	5.6 *6*	4269.33	2$^{(+)}$	2634.16	1$^+$,2$^+$			

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^{136}I β^- decay (83.4 s) 1977We04,1991Ma07 (continued)

γ(^{136}Xe) (continued)

E_γ[†]	I_γ[†#a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.
1666.0 *4*	2.6 *4*	2979.11	$1^+,2^+$	1313.028	2^+	
1709.4 *2*	10.4 *7*	4269.33	$2^{(+)}$	2559.88	(4^+)	
1820.0 *3*	3.2 *4*	4454.07	$1^{(-)},2^{(+)}$	2634.16	$1^+,2^+$	
1911.1 *4*	1.4 *3*	4545.0	$1,2^{(+)}$	2634.16	$1^+,2^+$	
1962.2 *3*	34.2 *19*	3275.22	3^-	1313.028	2^+	
1968.4 *4*	2.5 *4*	4947.5		2979.11	$1^+,2^+$	
1979.6 *3*	2.0 *3*	4269.33	$2^{(+)}$	2289.53	2^+	
2039.2 *4*	2.4 *4*	4454.07	$1^{(-)},2^{(+)}$	2414.74	2^+	
2168.2 *11*	1.2 *8*	5016.99	$(1,2^+)$	2849.41	$(1,2^+)$	
2289.6 *2*	156 *8*	2289.53	2^+	0.0	0^+	
2382.7 *3*	3.2 *4*	5016.99	$(1,2^+)$	2634.16	$1^+,2^+$	
2414.6 *2*	102 *5*	2414.74	2^+	0.0	0^+	
2548.2 *4*	1.9 *4*	5760.2		3211.90	$(1,2^+)$	
2582.4		2582.4	0^+	0.0	0^+	E0[‡]
2601.8 *9*	1.8 *9*	5016.99	$(1,2^+)$	2414.74	2^+	
2634.2 *2*	101 *5*	2634.16	$1^+,2^+$	0.0	0^+	
2657.9[bc] *4*	1.4[b] *2*	4947.5		2289.53	2^+	
2657.9[bc] *4*	1.4[b] *2*	5217.8		2559.88	(4^+)	
2828.5[c] *3*	1.5 *2*	6103.9?	1^-	3275.22	3^-	
2849.2 *7*	0.5 *2*	2849.41	$(1,2^+)$	0.0	0^+	
2868.9 *2*	59 *5*	2869.00	(2^+)	0.0	0^+	
2956.3 *2*	10.8 *6*	4269.33	$2^{(+)}$	1313.028	2^+	
2979.1 *3*	4.6 *4*	2979.11	$1^+,2^+$	0.0	0^+	
3141.1 *3*	10.4 *6*	4454.07	$1^{(-)},2^{(+)}$	1313.028	2^+	
3195.4[c] *4*	2.5 *3*	5321.06?	$(1^+,2^+)$	2125.70	$3^+,4^+$	
3211.8 *3*	7.7 *5*	3211.90	$(1,2^+)$	0.0	0^+	
3272.2[c] *7*	1.3 *3*	5832.2?	$(2^+,3,4^+)$	2559.88	(4^+)	
3349.2 *3*	2.9 *3*	6624.07		3275.22	3^-	
3634.6[b] *5*	1.8[b] *2*	4947.5		1313.028	2^+	
3634.6[b] *5*	1.8[b] *2*	5760.2		2125.70	$3^+,4^+$	
3673.9[c] *4*	2.5 *2*	5800.1?	1	2125.70	$3^+,4^+$	
3775.0[bc] *10*	0.40[b] *18*	6409.0?	$(1,2^+)$	2634.16	$1^+,2^+$	
3775.0[bc] *10*	0.40[b] *18*	6624.07		2849.41	$(1,2^+)$	
4063.9[c] *4*	2.5 *3*	6624.07		2559.88	(4^+)	
4208.9 *5*	0.69 *17*	6624.07		2414.74	2^+	
4269.5 *2*	5.3 *3*	4269.33	$2^{(+)}$	0.0	0^+	
4320		4320.1?	0^+	0.0	0^+	E0[‡]
4454.5 *7*	0.60 *15*	4454.07	$1^{(-)},2^{(+)}$	0.0	0^+	
4473.8[c] *3*	2.0 *2*	4474.05?	1	0.0	0^+	
4519.1[c] *10*	0.22 *10*	5832.2?	$(2^+,3,4^+)$	1313.028	2^+	
4544.4 *5*	0.86 *17*	4545.0	$1,2^{(+)}$	0.0	0^+	
4711.1 *4*	0.8 *2*	4711.2	1	0.0	0^+	
4739.1[c] *5*	1.6 *2*	6052.6?	$(1,2^+)$	1313.028	2^+	
4929.4 *3*	1.71 *18*	6624.07		1694.387	4^+	
5017.0 *3*	1.30 *14*	5016.99	$(1,2^+)$	0.0	0^+	
5217.5[c] *11*	0.40 *14*	5217.8		0.0	0^+	
5320.9[c] *3*	1.1 *2*	5321.06?	$(1^+,2^+)$	0.0	0^+	
5608.0[c] *4*	2.2 *5*	5608.1?	1	0.0	0^+	
5800.5[&c] *4*	1.9 *4*	5800.1?	1	0.0	0^+	
5870.7[&c] *12*	0.4 *3*	5870.8?	1	0.0	0^+	
5968.4[&c] *10*	0.21 *18*	5968.5?	$(1,2^+)$	0.0	0^+	

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^{136}I β^- decay (83.4 s) 1977We04,1991Ma07 (continued)

$\gamma(^{136}Xe)$ (continued)

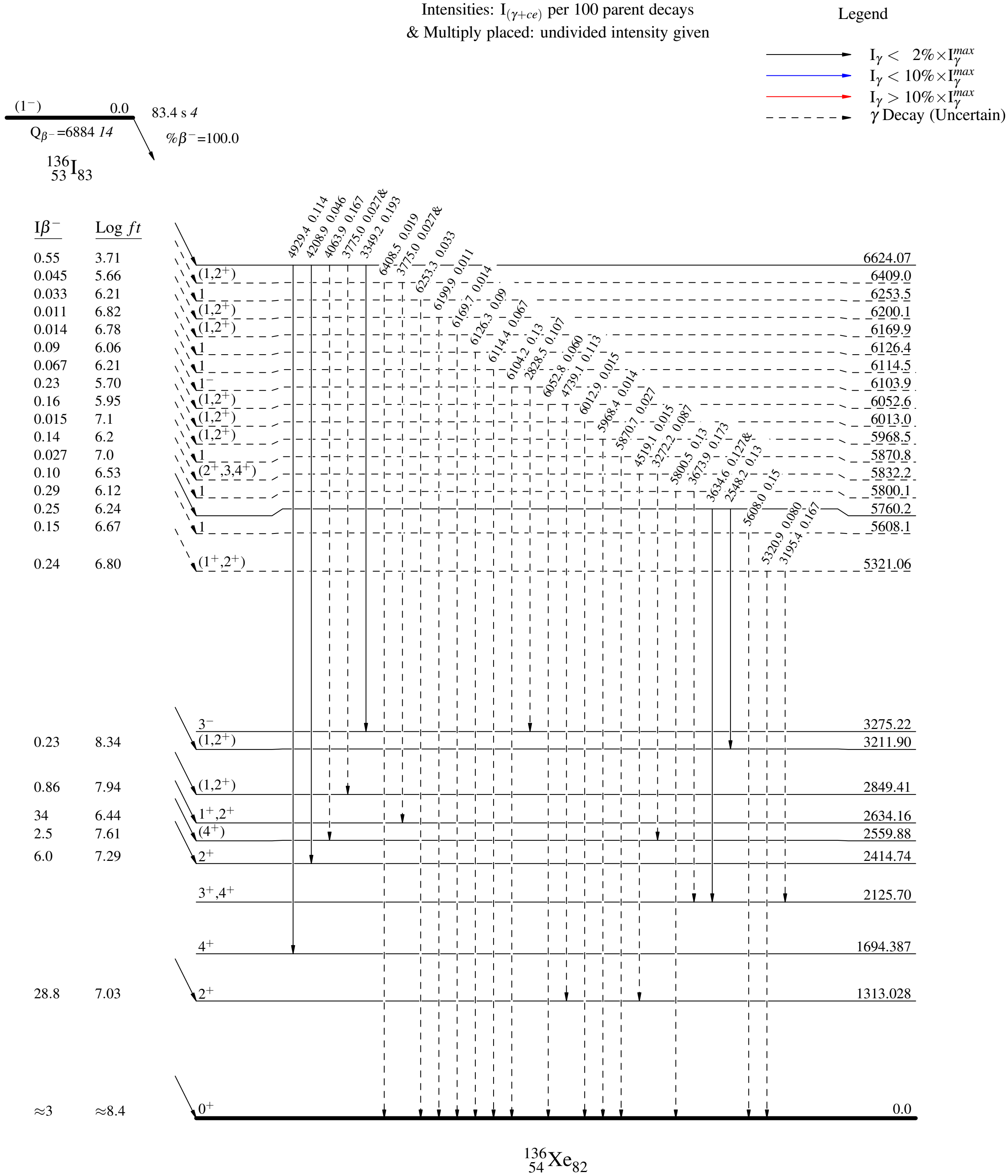
E_γ[†]	I_γ[†#a]	E_i(level)	J_i^π	E_f	J_f^π
6012.9[&c] *10*	0.22 *18*	6013.0?	(1,2$^+$)	0.0	0$^+$
6052.8[&c] *5*	0.8 *2*	6052.6?	(1,2$^+$)	0.0	0$^+$
6104.2[&c] *6*	2.0 *4*	6103.9?	1$^-$	0.0	0$^+$
6114.4[&c] *7*	1.0 *3*	6114.5?	1	0.0	0$^+$
6126.3[&c] *5*	1.4 *4*	6126.4?	1	0.0	0$^+$
6169.7[&c] *8*	0.21 *6*	6169.9?	(1,2$^+$)	0.0	0$^+$
6199.9[&c] *13*	0.17 *8*	6200.1?	(1,2$^+$)	0.0	0$^+$
6253.3[&c] *8*	0.50 *15*	6253.5?	1	0.0	0$^+$
6408.5[&c] *12*	0.28 *10*	6409.0?	(1,2$^+$)	0.0	0$^+$

[†] From 1977We04, except where noted.
[‡] ce seen but no corresponding γ ray (1991Ma07).
[#] Normalized to Iγ(1321γ)=372 so that Iγ(1313γ)=1000 for both 46.6-s and 83.4-s decay.
[@] Eγ from 1979Bo26 (curved crystal spectrometer). Iγ from intensity imbalance.
[&] These gammas were assumed to be g.s. transitions by 1977We04 from comparison of Eγ to Q(β^-).
[a] For absolute intensity per 100 decays, multiply by 0.0667 *11*.
[b] Multiply placed with undivided intensity.
[c] Placement of transition in the level scheme is uncertain.

^{136}I β^- decay (83.4 s) 1977We04,1991Ma07

Decay Scheme

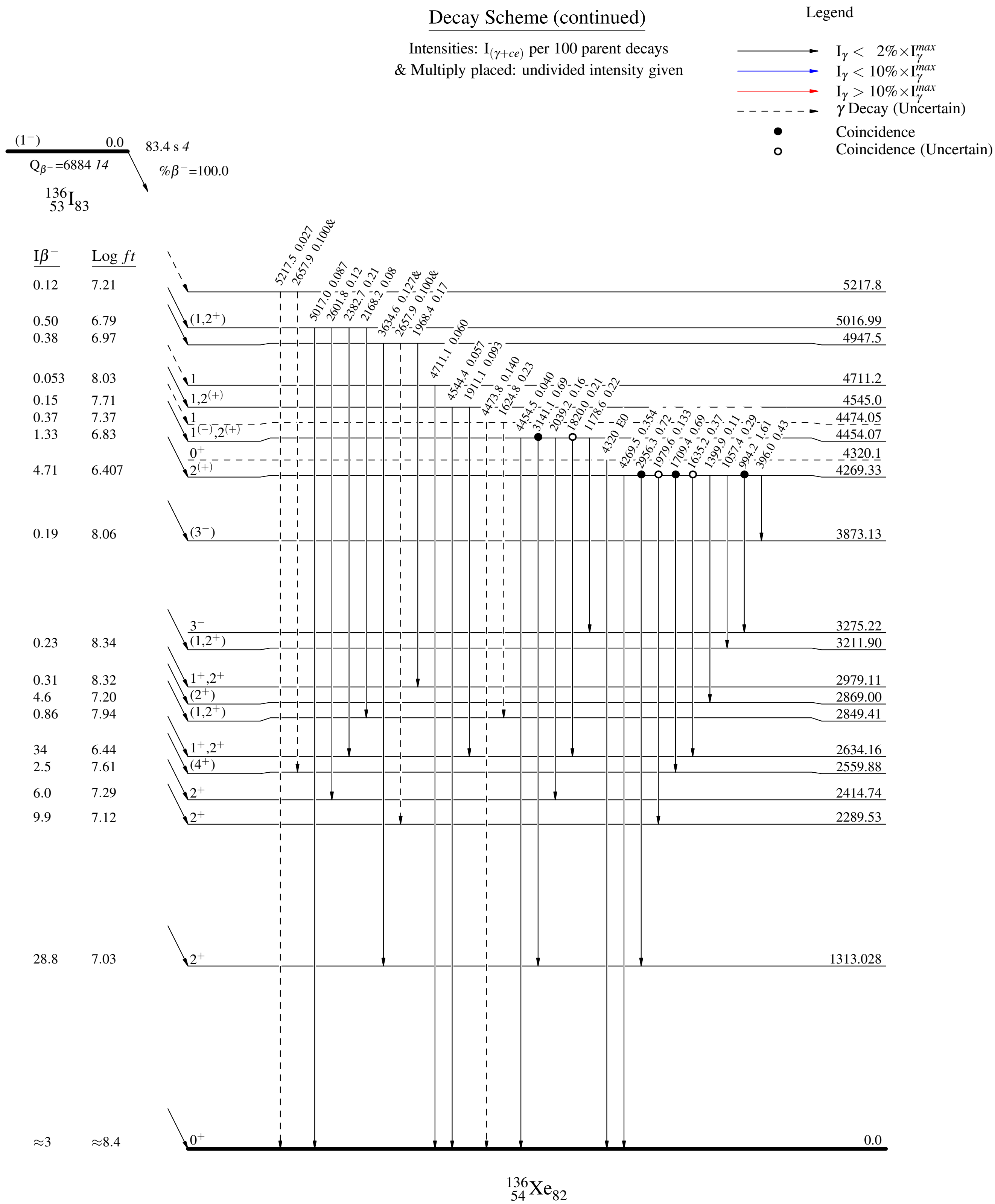
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



$^{136}I\ \beta^-$ decay (83.4 s) 1977We04,1991Ma07

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given



^{136}I β^- decay (83.4 s) 1977We04,1991Ma07

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
& Multiply placed: undivided intensity given