^{83}Zr ε decay 1992Bu10,1987Ra06

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 125, 201 (2015)	31-Dec-2014

Parent: ^{83}Zr: E=0.0; $J^\pi=(1/2^-)$; $T_{1/2}$=42 s *2*; Q(ε)=6294 *20*; %ε+%$β^+$ decay=100.0

1992Bu10, 1987Ra06: ^{83}Zr activity produced in the ^{nat}Mo(^{3}He,X) reaction with E(^{3}He)=280 MeV followed by mass separation. Measured Eγ, Iγ, γγ, γγ(t), βγ coin,

1982De36: ^{83}Zr activity produced in the ^{54}Fe(^{32}S,2pn) reaction with E(^{32}S)=100-160 MeV followed by separation in a β recoil time of flight mass spectrometer. Measured Eβ, Iβ, Eγ, Iγ, x-rays, βγ, γγ, γ-x-ray coincidences, γ(t) using a Ge(Li) detector, a thick plastic scintillator, and an x-ray detector.

Others: 1982Li17, 1981SaZO.

A total energy release of 6300 keV *300* is calculated for this decay scheme using the RADLST code, in good agreement with the Q value of 6294 keV *20*.

α: Additional information 1.

^{83}Y Levels

1992Bu10 and 1987Ra06 report a level at 483.9 keV deexcited by a 324.6-keV γ ray to the 97.1 level, obviously a mistake. γγ-coin data in 1987Ra06 show the 324.6 and 97.1 γ rays to be in coincidence. Therefore, the 324.6 γ ray deexcites the 422.0 level.

E(level)†	Jπ‡	$T_{1/2}$#	Comments
0.0	$9/2^+$	7.08 min *8*	
62.02 *24*	$3/2^-$	2.85 min *2*	
97.1 *3*	$5/2^+$	9.8 ns *10*	$T_{1/2}$: from delayed coincidence of 234γ-97γ (centroid shift) in 1987Ra06.
117.58 *24*	$(1/2^-)$		
144.88 *24*	$7/2^+$		
167.03 *24*	$5/2^-$		
331.60 *25*	$(5/2^+)$		
421.80 *24*	$(3/2^-)$		
436.8 *3*	(5/2)		
536.40 *24*	$(7/2^-)$		
564.6 *3*	$(1/2^-,3/2,5/2^-)$		
565.5 *3*	$(1/2^-,3/2,5/2^-)$		
570.4 *3*	$(3/2^+,5/2)$		
642.4 *3*	$(3/2,5/2^-)$		
722.2 *3*	$(3/2^-,5/2)$		
855.5 *3*	(3/2)		
882.4 *4*			
1249.7 *3*	$(3/2^-)$		
1955.9 *4*			
2083.0 *3*	$(3/2^-)$		
2136.7 *3*	(3/2)		
2260.0 *4*			
2738.1 *6*			

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

^{83}Zr ε decay 1992Bu10,1987Ra06 (continued)

ε,β+ radiations

E(decay)	E(level)	Iβ+ ‡	Iε‡	Log *ft*	I(ε+β+)†‡	Comments
(3556 *20*)	2738.1	0.04 *4*	0.004 *4*	7.1 *5*	0.04 *4*	av Eβ=1137.0 *94*; εK=0.0956 *21*; εL=0.01129 *25*; εM+=0.00250 *6*
(4034 *20*)	2260.0	0.22 *5*	0.016 *3*	6.64 *10*	0.24 *5*	av Eβ=1361.5 *95*; εK=0.0593 *12*; εL=0.00700 *14*; εM+=0.00155 *3*
(4157 *20*)	2136.7	0.87 *8*	0.056 *6*	6.1 *1*	0.93 *9*	av Eβ=1419.8 *95*; εK=0.0530 *10*; εL=0.00625 *12*; εM+=0.00138 *3*
(4211 *20*)	2083.0	1.0 *1*	0.064 *6*	6.1 *1*	1.1 *1*	av Eβ=1445.2 *95*; εK=0.0505 *9*; εL=0.00595 *11*; εM+=0.001318 *24*
(4338 *20*)	1955.9	0.072 *16*	0.0039 *9*	7.32 *10*	0.076 *17*	av Eβ=1505.4 *95*; εK=0.0452 *8*; εL=0.00533 *10*; εM+=0.001179 *21*
(5044 *20*)	1249.7	0.94 *10*	0.029 *3*	6.6 *1*	0.97 *10*	av Eβ=1842.2 *96*; εK=0.0260 *4*; εL=0.00306 *5*; εM+=0.000677 *10*
(5412 *20*)	882.4	0.17 *3*	0.0039 *7*	7.5 *1*	0.17 *3*	av Eβ=2018.6 *97*; εK=0.0202 *3*; εL=0.00238 *4*; εM+=0.000526 *7*
(5439 *20*)	855.5	4.6 *4*	0.11 *1*	6.1 *1*	4.7 *4*	av Eβ=2031.5 *97*; εK=0.0198 *3*; εL=0.00233 *3*; εM+=0.000517 *7*
(5572 *20*)	722.2	0.51 *11*	0.011 *2*	7.10 *10*	0.52 *11*	av Eβ=2095.7 *97*; εK=0.01820 *24*; εL=0.00214 *3*; εM+=0.000474 *7*
(5652 *20*)	642.4	1.7 *4*	0.034 *8*	6.62 *11*	1.7 *4*	av Eβ=2134.2 *97*; εK=0.01730 *22*; εL=0.00204 *3*; εM+=0.000451 *6*
(5724 *20*)	570.4	0.08 *5*	0.003 *2*	9.7[1u] *3*	0.08 *5*	av Eβ=2170.5 *95*; εK=0.0364 *5*; εL=0.00431 *6*; εM+=0.000955 *13*
(5729 *20*)	565.5	1.8 *2*	0.034 *4*	6.6 *1*	1.8 *2*	av Eβ=2171.3 *97*; εK=0.01649 *21*; εL=0.001941 *25*; εM+=0.000429 *6*
(5729 *20*)	564.6	0.98 *10*	0.019 *2*	6.9 *1*	1.0 *1*	av Eβ=2171.7 *97*; εK=0.01648 *21*; εL=0.001940 *25*; εM+=0.000429 *6*
(5758 *20*)	536.40	3.4 *7*	0.065 *13*	6.4 *1*	3.5 *7*	av Eβ=2185.4 *97*; εK=0.01620 *20*; εL=0.001906 *24*; εM+=0.000422 *6*
(5857 *20*)	436.8	0.60 *12*	0.011 *2*	7.2 *1*	0.61 *12*	av Eβ=2233.5 *97*; εK=0.01525 *19*; εL=0.001794 *22*; εM+=0.000397 *5*
(5872 *20*)	421.80	10.3 *9*	0.181 *16*	5.9 *1*	10.5 *9*	av Eβ=2240.7 *97*; εK=0.01511 *19*; εL=0.001778 *22*; εM+=0.000393 *5*
(5962 *20*)	331.60	0.58 *16*	0.022 *6*	8.99[1u] *13*	0.60 *17*	av Eβ=2284.1 *96*; εK=0.0313 *4*; εL=0.00370 *5*; εM+=0.000820 *11*
(6127 *20*)	167.03	1.5 *13*	0.022 *19*	6.9 *4*	1.5 *13*	av Eβ=2364.0 *97*; εK=0.01302 *15*; εL=0.001532 *18*; εM+=0.000339 *4*
(6149 *20*)	144.88	0.30 *8*	0.0044 *12*	7.58 *12*	0.30 *8*	av Eβ=2374.7 *97*; εK=0.01286 *15*; εL=0.001512 *18*; εM+=0.000335 *4*
(6176 *20*)	117.58	8.2 *18*	0.12 *3*	6.14 *10*	8.3 *18*	av Eβ=2387.9 *97*; εK=0.01266 *15*; εL=0.001489 *17*; εM+=0.000330 *4*
(6197 *20*)	97.1	1.6 *5*	0.053 *16*	8.67[1u] *13*	1.7 *5*	av Eβ=2395.9 *96*; εK=0.0272 *4*; εL=0.00321 *4*; εM+=0.000712 *9*
(6232 *20*)	62.02	59 *6*	0.84 *9*	5.3 *1*	60 *6*	av Eβ=2414.8 *97*; εK=0.01227 *14*; εL=0.001443 *17*; εM+=0.000319 *4*

† Derived from an intensity imbalance at each level.
‡ Absolute intensity per 100 decays.

γ(^{83}Y)

Iγ normalization: deduced from decay scheme assuming ΣI(γ+ce)(to g.s.)=100%. Ground state feeding is not expected with ΔJ=4, Δπ=yes.

E_γ[†]	I_γ[†&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α	Comments
55.55[‡] *4*	100 *5*	117.58	(1/2$^-$)	62.02	3/2$^-$	M1	0.957	α(K)=0.840 *12*; α(L)=0.0981 *14*; α(M)=0.01681 *24*; α(N)=0.00225 *4*; α(O)=0.0001513 *22* α(K)exp=1.2 *3*, α(L+...)exp=0.13 *3* (1987Ra06); α(exp)=1.1 *2* (1982De36). I_γ: ΔIγ estimated by evaluator. Mult.: from ce data. δ<0.2 from α(exp).
62.1[@] *3*	5.5[@] *6*	62.02	3/2$^-$	0.0	9/2$^+$	E3	90.8 *25*	α(K)=45.6 *11*; α(L)=37.7 *12*; α(M)=6.71 *22*; α(N)=0.763 *24*; α(O)=0.00557 *13* I_γ: corrected for $T_{1/2}$=2.8−min isomer decay. α(K)exp=73 *18*, ce(K)/(ce(L)+ce(M)+ce(N))exp=1.06 *37* (1987Ra06). Mult.: from α(K)exp and subshell ratio.
70.0[@] *3*	1.1[#@] *1*	167.03	5/2$^-$	97.1	5/2$^+$			
97.1[@] *3*	21.4[@] *21*	97.1	5/2$^+$	0.0	9/2$^+$	E2	1.185 *22*	α(K)=0.983 *18*; α(L)=0.169 *4*; α(M)=0.0291 *6*; α(N)=0.00360 *7*; α(O)=0.000145 *3* α(K)exp=1.00 *25*, α(L+...)exp=0.31 *8* (1987Ra06). Mult.: from α(K)exp.
105.01[‡] *4*	85[@] *9*	167.03	5/2$^-$	62.02	3/2$^-$	M1	0.1585	α(K)=0.1393 *20*; α(L)=0.01606 *23*; α(M)=0.00275 *4*; α(N)=0.000368 *6*; α(O)=2.51×10^{-5} *4* α(K)exp=0.5 *1*, α(L+...)exp=0.017 *4* (1987Ra06); α(exp)=0.9 *6* (1982De36). I_γ: other: 76 *3* (1982De06). Mult.: from ce data in 1987Ra06. α(exp) from 1982De36 suggests E2, however, uncertainty on the measurement is large.
114.5[@] *3*	<1[@]	536.40	(7/2$^-$)	421.80	(3/2$^-$)			
133.0[@] *3*	<1[@]	855.5	(3/2)	722.2	(3/2$^-$,5/2)			
144.8[@] *3*	4.7[@] *5*	144.88	7/2$^+$	0.0	9/2$^+$	M1	0.0660	α(K)=0.0581 *9*; α(L)=0.00664 *10*; α(M)=0.001137 *18*; α(N)=0.0001524 *23* α(O)=1.044×10^{-5} *16* α(exp)=0.074 *29* (1992Bu10). Mult.: from α(exp).
164.5[@a] *3*	<1[@]	331.60	(5/2$^+$)	167.03	5/2$^-$			
185.9 *3*	<1	722.2	(3/2$^-$,5/2)	536.40	(7/2$^-$)			
186.7[@] *3*	<1[@]	331.60	(5/2$^+$)	144.88	7/2$^+$			
213.2[@] *3*	4.7[@] *5*	855.5	(3/2)	642.4	(3/2,5/2$^-$)			
220.6[@] *3*	5.1[@] *5*	642.4	(3/2,5/2$^-$)	421.80	(3/2$^-$)			

$^{83}_{39}$Y$_{44}$-3

^{83}Zr ε decay 1992Bu10,1987Ra06 (continued)

γ(^{83}Y) (continued)

E_γ †	I_γ †&	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α	Comments
234.5@ 3	12.6@ 13	331.60	(5/2$^+$)	97.1	5/2$^+$	M1	0.0186	α(K)=0.01640 24; α(L)=0.00185 3; α(M)=0.000316 5; α(N)=4.25×10^{-5} 7; α(O)=2.93×10^{-6} 5 α(exp)=0.020 6 (1992Bu10). Mult.: from α(exp).
238.9@ 3	<1@	570.4	(3/2$^+$,5/2)	331.60	(5/2$^+$)			
254.76‡ 4	50@ 5	421.80	(3/2$^-$)	167.03	5/2$^-$	M1	0.01506	α(K)=0.01328 19; α(L)=0.001492 21; α(M)=0.000255 4; α(N)=3.43×10^{-5} 5; α(O)=2.37×10^{-6} 4 α(exp)=0.015 3 (1992Bu10). I_γ: other: 63 3 (1982De06). Mult.: from α(exp).
269.8@ 3	3.8@ 4	436.8	(5/2)	167.03	5/2$^-$			
285.4@ 3	<1@	722.2	(3/2$^-$,5/2)	436.8	(5/2)			
290.0@ 3	1.3#@ 2	855.5	(3/2)	565.5	(1/2$^-$,3/2,5/2$^-$)			
291.0@ 3	1.0#@ 1	855.5	(3/2)	564.6	(1/2$^-$,3/2,5/2$^-$)			
300.3a 2	<1	722.2	(3/2$^-$,5/2)	421.80	(3/2$^-$)			
304.21‡ 4	54@ 5	421.80	(3/2$^-$)	117.58	(1/2$^-$)	M1(+E2)	0.015 5	α(K)=0.013 5; α(L)=0.0015 6; α(M)=0.00026 10; α(N)=3.4×10^{-5} 13; α(O)=2.2×10^{-6} 7 α(exp)=0.011 2 (1992Bu10). I_γ: other: 54 3 (1982De06). Mult.: from α(exp); δ < 0.7 from α(exp).
310.5@ 3	2.2@ 2	642.4	(3/2,5/2$^-$)	331.60	(5/2$^+$)			
319.2@ 3	6.2@ 6	855.5	(3/2)	536.40	(7/2$^-$)			
324.6@ 3	8.5@ 9	421.80	(3/2$^-$)	97.1	5/2$^+$			E_γ: transition was placed incorrectly from a 483.9 level by 1992Bu06 and 1987Ra06.
359.80‡ 5	40@ 4	421.80	(3/2$^-$)	62.02	3/2$^-$			I_γ: other: 36 2 (1982De06).
370.1@ 3	<1@	536.40	(7/2$^-$)	167.03	5/2$^-$			
374.8@ 3	9.2@ 9	436.8	(5/2)	62.02	3/2$^-$			
397.6@ 3	4.0#@ 4	564.6	(1/2$^-$,3/2,5/2$^-$)	167.03	5/2$^-$			
398.5@ 3	4.0#@ 4	565.5	(1/2$^-$,3/2,5/2$^-$)	167.03	5/2$^-$			
418.7@ 3	2.1#@ 2	855.5	(3/2)	436.8	(5/2)			
418.8a 2	<1	536.40	(7/2$^-$)	117.58	(1/2$^-$)			
425.5@ 3	<1@	570.4	(3/2$^+$,5/2)	144.88	7/2$^+$			
433.7@ 3	2.1@ 2	855.5	(3/2)	421.80	(3/2$^-$)			
447.0 2	2.0# 4	564.6	(1/2$^-$,3/2,5/2$^-$)	117.58	(1/2$^-$)			
448.0@ 3	8.9@ 9	565.5	(1/2$^-$,3/2,5/2$^-$)	117.58	(1/2$^-$)			
474.38‡ 6	58#@ 6	536.40	(7/2$^-$)	62.02	3/2$^-$			I_γ: other: 68 5 (1982De06).
475.4@ 3	11.2#@ 11	642.4	(3/2,5/2$^-$)	167.03	5/2$^-$			

$^{83}_{39}Y_{44}$-4

^{83}Zr ε decay 1992Bu10,1987Ra06 (continued)

γ(^{83}Y) (continued)

E_γ †	I_γ †&	E_i(level)	J_i^π	E_f	J_f^π	E_γ †	I_γ †&	E_i(level)	J_i^π	E_f	J_f^π
502.5@ *3*	8.2#@ *8*	564.6	(1/2⁻,3/2,5/2⁻)	62.02	3/2⁻	1494.3 *2*	2.7 *4*	2136.7	(3/2)	642.4	(3/2,5/2⁻)
503.5@ *3*	12.4#@ *12*	565.5	(1/2⁻,3/2,5/2⁻)	62.02	3/2⁻	1519.1 *3*	1.0 *2*	1955.9		436.8	(5/2)
524.1@ *3*	<1@	855.5	(3/2)	331.60	(5/2⁺)	1546.8 *4*	1.5 *3*	2083.0	(3/2⁻)	536.40	(7/2⁻)
524.8@ *3*	7.4#@ *7*	642.4	(3/2,5/2⁻)	117.58	(1/2⁻)	1600.5 *3*	2.7 *3*	2136.7	(3/2)	536.40	(7/2⁻)
550.8@ *3*	2.2@ *2*	882.4		331.60	(5/2⁺)	1661.3 *3*	3.5 *4*	2083.0	(3/2⁻)	421.80	(3/2⁻)
580.3@ *3*	4.4@ *4*	642.4	(3/2,5/2⁻)	62.02	3/2⁻	1699.9 *5*	1.4 *2*	2136.7	(3/2)	436.8	(5/2)
660.2@ *3*	6.8@ *7*	722.2	(3/2⁻,5/2)	62.02	3/2⁻	1714.8 *4*	<1	2136.7	(3/2)	421.80	(3/2⁻)
688.4@ *3*	3.9@ *4*	855.5	(3/2)	167.03	5/2⁻	1751.3 *4*	<1	2083.0	(3/2⁻)	331.60	(5/2⁺)
713.4@ *3*	3.0@ *3*	1249.7	(3/2⁻)	536.40	(7/2⁻)	1838.1[a] *7*	1.6 *4*	2260.0		421.80	(3/2⁻)
758.5@ *3*	2.6@ *3*	855.5	(3/2)	97.1	5/2⁺	1915.8 *3*	1.3 *4*	2083.0	(3/2⁻)	167.03	5/2⁻
793.5@ *3*	37@ *4*	855.5	(3/2)	62.02	3/2⁻	1964.9[a] *5*	3.3 *4*	2083.0	(3/2⁻)	117.58	(1/2⁻)
827.8 *2*	2.2 *4*	1249.7	(3/2⁻)	421.80	(3/2⁻)	2020.8 *5*	3.0 *4*	2083.0	(3/2⁻)	62.02	3/2⁻
1132.1 *2*	7.6 *8*	1249.7	(3/2⁻)	117.58	(1/2⁻)	2074.8 *4*	5.0 *5*	2136.7	(3/2)	62.02	3/2⁻
[x]1132.8‡ *3*	≈1					2142.4 *4*	1.6 *4*	2260.0		117.58	(1/2⁻)
1361.1 *3*	1.0 *2*	2083.0	(3/2⁻)	722.2	(3/2⁻,5/2)	2316.3 *5*	<1	2738.1		421.80	(3/2⁻)

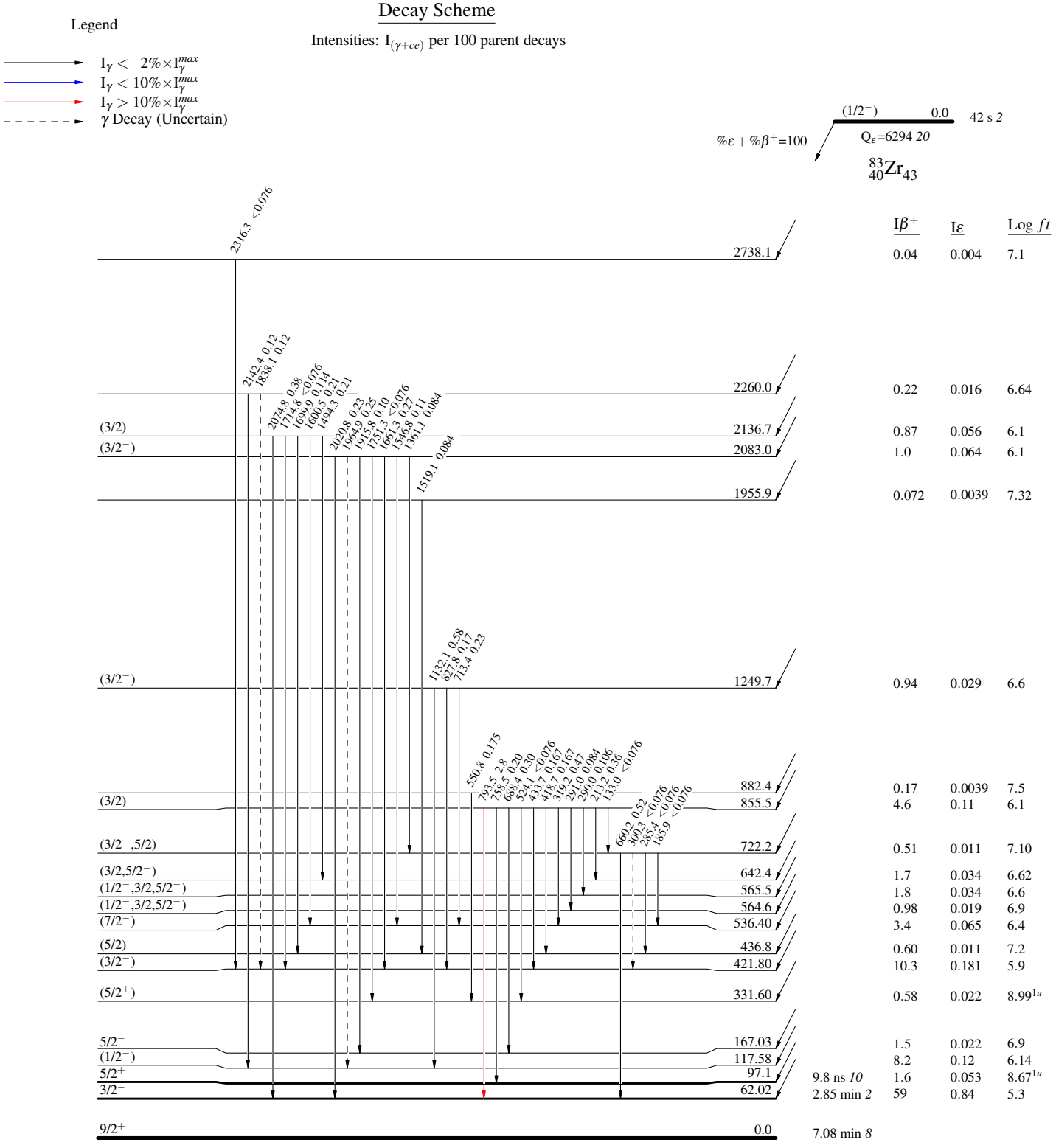
† From 1992Bu10, except where noted.
‡ From 1982De36.
# Iγ deduced from γγ coincidence data.
@ From 1987Ra06. Authors do not provide uncertainties. However, since 1992Bu10 are from the same set up and similar authors, the evaluator assumes the uncertainties are comparable and takes ΔEγ=0.3 keV and ΔIγ=10%.
& For absolute intensity per 100 decays, multiply by 0.076 *8*.
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

$^{83}_{39}Y_{44}$-5

^{83}Zr ε decay 1992Bu10,1987Ra06

Decay Scheme

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



$^{83}_{39}Y_{44}$

^{83}Zr ε decay 1992Bu10,1987Ra06

Decay Scheme (continued)

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