^{172}Er β^- decay (49.3 h) 1976MeZC,1972Ba01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	08-Dec-2015

Parent: ^{172}Er: E=0; J$^\pi$=0$^+$; $T_{1/2}$=49.3 h *5*; Q(β^-)=891 *5*; %β^- decay=100.0
^{172}Er-$T_{1/2}$: From ^{172}Er Adopted Levels.
^{172}Er-Q(β^-): From 2012Wa38.
^{172}Er isotope produced by double neutron capture in enriched ^{170}Er.
1976MeZC (also 1974MeZS,1974LaZQ): measured γ, $\gamma\gamma$. See also 1978LeZA for data from 1976MeZC.
1974LaZQ: ion exchange for source separation. Measured γ, $\gamma\gamma$.
1972Ba01: ion exchange for source separation. Measured γ, $\gamma\gamma$, ce. ce data with double-focusing spectrometers.
Others:
γ: 1967Cl05, 1965Ha24, 1962Gu03, 1961He10, 1961Ba02, 1961Or01, 1961Ha42, 1960Ew07.
β^-, $\beta\gamma$: 1965Ha24, 1962Gu03, 1961Or01, 1961He10.
ce: 1965Ha24, 1961He10.
$\gamma\gamma$: 1962Gu03, 1961Or01, 1961He10, 1961Ha42.
$\beta\gamma$(t): 1968Ha08.
γce: 1965Ha24.
$\gamma\gamma(\theta)$: 1989KrZS. Details of this work are not yet available.
$T_{1/2}$(^{172}Er): 1962Gu03, 1961Or01, 1961Ha42, 1956Ne08.
The decay scheme is from 1976MeZC (see also 1978LeZA).

^{172}Tm Levels

Band assignments are from 1972Ba01 and 1976MeZC.

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$[‡]	Comments
0.0[#]	2$^-$	63.6 h *2*	
62.529[#] *4*	(3)$^-$		
145.84[#] *6*	(4$^-$)		
239.92 *5*	(3$^-$)		
407.338[@] *2*	(1)$^-$	1.07 ns *5*	$T_{1/2}$: (K x ray)(407γ)(t) (1968Ha08).
446.036[@] *4*	(2)$^-$		
475.446[&] *2*	(0)$^-$		
479.68 *9*	(1$^-$,2$^-$)		
496.34? *12*			
526.23 *5*	(0$^-$,1,2$^-$)		
535.140[&] *3*	(1)$^-$	1.22 ns *5*	$T_{1/2}$: from β(K x ray)(t) (1968Ha08).
610.062 *2*	1$^+$	≤0.3 ns	$T_{1/2}$: from β(610γ)(t) (1968Ha08).
714.50 *9*	(0$^-$,1)		
797.42 *10*	(0$^-$,1)		

[†] From least-squares fit to Eγ values.
[‡] From Adopted Levels.
[#] Band(A): π1/2[411]$\otimes\nu$5/2[512],K^π=2$^-$.
[@] Band(B): π1/2[411]$\otimes\nu$1/2[521],K^π=1$^-$.
[&] Band(C): π1/2[411]$\otimes\nu$1/2[521],K^π=0$^-$.

^{172}Er β^- decay (49.3 h) 1976MeZC,1972Ba01 (continued)

β^- radiations

E(decay)	E(level)	Iβ^- †	Log *ft*	Comments
(94 *5*)	797.42	0.0117 *13*	7.65 *8*	av Eβ=24.4 *14*
(177 *5*)	714.50	0.014 *3*	8.42 *11*	av Eβ=47.6 *15*
279 *5*	610.062	46.4 *20*	5.56 *3*	av Eβ=78.8 *16* E(decay): weighted average of 310 *30* (1961He10), 260 *50* (1961Or01), 278 *5* (1962Gu03), 292 *15* (1965Ha24).
381 *8*	535.140	46.4 *24*	5.89 *3*	av Eβ=102.4 *17* E(decay): from 1965Ha24. Others: 1962Gu03, 1961Or01, 1961He10.
(365 *5*)	526.23	0.028 *18*	9.1 *2*	av Eβ=117.8 *17*
(411 *5*)	479.68	0.026 *4*	9.33 *7*	av Eβ=120.5 *17*
(416 *5*)	475.446	<4	>7.2	av Eβ=121.9 *17*
(484 *5*)	407.338	3.3 *16*	7.46 *22*	av Eβ=144.8 *17*
≈900‡	0.0	<7	>8.5^{1u}	av Eβ=301.6 *19* Iβ^-: from expected log $f^{1u}t$>8.5. Iβ≈10 (1961He10), <5 (1962Gu03).

† Absolute intensity per 100 decays.
‡ Existence of this branch is questionable.

^{172}Er β^- decay (49.3 h) 1976MeZC,1972Ba01 (continued)

$\gamma(^{172}$Tm)

Iγ normalization: Σ(I(γ+ce) to g.s.)=96.5 *35*. β^- feeding of g.s. is unknown but it is assumed as <7% from expected log $f^{1u}t$>8.5 for a 0$^+$ to 2$^-$ β transition.

E$_\gamma$[†]	I$_\gamma$[†&]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[‡]	δ[‡]	α[@]	Comments
29.37 *5*	0.018 *5*	475.446	(0)$^-$	446.036	(2)$^-$	E2		755 *13*	α(L)=579 *10*; α(M)=140.8 *23* α(N)=31.8 *6*; α(O)=3.60 *6*; α(P)=0.001301 *22* E$_\gamma$: average of 29.42 *5* (1974MeZS) and 29.32 *5* (1972Ba01). Mult.: α(L2)exp=228 *70*, α(L3)exp=275 *90*, α(M2)exp+α(M3)exp=140 *45*, α(N)exp=39 *12* (1972Ba01). δ(E2/M1)>1.7. α(L)exp=395 (1965Ha24).
38.66 *5*	0.017 *5*	446.036	(2)$^-$	407.338	(1)$^-$	M1+E2	0.6 *1*	57 *12*	α(L)=44 *10*; α(M)=10.6 *23* α(N)=2.4 *6*; α(O)=0.28 *6*; α(P)=0.00199 *15* E$_\gamma$: average of 38.69 *6* (1976MeZC) and 38.63 *5* (1972Ba01). Mult.,δ: L1:L2:L3:M=≈0.15:0.53:0.78:0.44. α(L1)exp≈8.6, α(L2)exp=31, α(L3)exp=46 *15*, α(M)exp=26. δ is based on assigned uncertainty of 50% on Ice values.
59.692 *6*	6.4 *2*	535.140	(1)$^-$	475.446	(0)$^-$	M1		14.2	Mult.: L1:L2:M1:N1=8.3:0.56:1.6:0.38. α(L1)exp=1.3 *3*, α(L2)exp=0.087 *20*, α(M1)exp=0.26 *6*, α(N1)exp=0.059 *13* (1972Ba01). α(L)exp=1.5 (1965Ha24).
62.524 *4*	0.49 *1*	62.529	(3)$^-$	0.0	2$^-$	M1+E2	0.29 *8*	12.6 *4*	α(K)=9.3 *4*; α(L)=2.5 *6*; α(M)=0.59 *14* α(N)=0.14 *3*; α(O)=0.018 *4*; α(P)=0.000584 *23* Mult.,δ: L1:L2:L3=0.6:0.24:0.38. α(L1)exp=1.3 *3*, α(L2)exp=0.49 *11*, α(L3)exp=0.77 *17* (1972Ba01).
68.107 *4*	7.82 *16*	475.446	(0)$^-$	407.338	(1)$^-$	M1		9.38	α(K)=7.84 *11*; α(L)=1.200 *17*; α(M)=0.268 *4* α(N)=0.0626 *9*; α(O)=0.00899 *13*; α(P)=0.000485 *7* Mult.: K:L1:L2:L3:M1=63.2:6.7:0.61:0.22:2.2. δ(E2/M1)=0.05 *2* from L-subshell ratios. α(K)=8.08, α(L1)exp=0.86 *10*, α(L2)exp=0.078 *18*, α(L3)exp=0.028 *6*, α(M1)exp=0.28 *6* (1972Ba01). Ice(K) for 68γ (mult=M1 as given by subshell ratios) is used for normalization of ce data for other transitions.
74.940 *8*	0.28 *1*	610.062	1$^+$	535.140	(1)$^-$	E1		0.710	α(K)=0.582 *9*; α(L)=0.0999 *14*; α(M)=0.0223 *4* α(N)=0.00509 *8*; α(O)=0.000660 *10*; α(P)=2.50×10^{-5} *4* Mult.: α(K)exp≈0.23 (1972Ba01).
80.19 *5*	0.010 *5*	526.23	(0$^-$,1,2$^-$)	446.036	(2)$^-$	[D,E2]		4.0 *34*	
83.15 *25*	0.007 *2*	145.84	(4$^-$)	62.529	(3)$^-$	[M1,E2]		5.8 *6*	α(K)=3.0 *15*; α(L)=2.2 *15*; α(M)=0.52 *38* α(N)=0.119 *85*; α(O)=0.0142 *93*; α(P)=1.7×10^{-4} *11*
89.09 *4*	0.011 *1*	535.140	(1)$^-$	446.036	(2)$^-$	[M1,E2]		4.56 *25*	α(K)=2.5 *12*; α(L)=1.6 *11*; α(M)=0.39 *27* α(N)=0.088 *60*; α(O)=0.0106 *65*; α(P)=1.40×10^{-4} *83* Mult.: α(K)exp≈11.8 (1972Ba01) is too large for M1 or E2. 1972Ba01 assign M1,E2.
113.71 *13*	0.003 *2*	610.062	1$^+$	496.34?		[D,E2]		1.2 *10*	
118.9 *2*	0.002 *1*	526.23	(0$^-$,1,2$^-$)	407.338	(1)$^-$	[D,E2]		1.1 *9*	

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$\gamma(^{172}$Tm) (continued)

E_γ[†]	I_γ[†&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	α[@]	Comments
127.805 *3*	5.05 *11*	535.140	(1)$^-$	407.338	(1)$^-$	M1+E2	0.6 *3*	1.46 *6*	α(K)=1.10 *14*; α(L)=0.28 *6*; α(M)=0.065 *15* α(N)=0.015 *4*; α(O)=0.0019 *4*; α(P)=6.5×10^{-5} *10* Mult.: from α(K)exp=1.13 *25* and α(L1)exp=0.15 *3* (1972Ba01). α(L)exp=0.097 (1965Ha24).
134.68 *6*	0.024 *1*	610.062	1$^+$	475.446	(0)$^-$	[E1]		0.1517	α(K)=0.1265 *18*; α(L)=0.0197 *3*; α(M)=0.00438 *7* α(N)=0.001009 *15*; α(O)=0.0001361 *20*; α(P)=5.88×10^{-6} *9*
145.83 *15*	0.003 *2*	145.84	(4$^-$)	0.0	2$^-$	[E2]		0.769	α(K)=0.400 *6*; α(L)=0.283 *5*; α(M)=0.0687 *11* α(N)=0.01565 *23*; α(O)=0.00186 *3*; α(P)=1.745×10^{-5} *25*
164.013 *5*	1.60 *6*	610.062	1$^+$	446.036	(2)$^-$	E1		0.0902	α(K)=0.0754 *11*; α(L)=0.01151 *17*; α(M)=0.00256 *4* α(N)=0.000590 *9*; α(O)=8.04×10^{-5} *12*; α(P)=3.60×10^{-6} *5* Mult.: α(K)exp=0.079 *17* (1972Ba01), 0.10 (1965Ha24). δ(M2/E1)<0.07.
167.40 *7*	0.017 *2*	407.338	(1)$^-$	239.92	(3$^-$)	[E2]		0.475	α(K)=0.272 *4*; α(L)=0.1559 *22*; α(M)=0.0377 *6* α(N)=0.00860 *13*; α(O)=0.001032 *15*; α(P)=1.223×10^{-5} *18*
177.16 *15*	0.0023 *7*	239.92	(3$^-$)	62.529	(3)$^-$	[M1,E2]		0.50 *12*	α(K)=0.37 *15*; α(L)=0.100 *23*; α(M)=0.0234 *62* α(N)=0.0054 *14*; α(O)=0.00070 *12*; α(P)=2.1×10^{-5} *11*
179.6 *4*	0.0023 *9*	714.50	(0$^-$,1)	535.140	(1)$^-$	[D,E2]		0.34 *25*	
187.4[#a] *4*	0.002 *2*	797.42	(0$^-$,1)	610.062	1$^+$	[D,E2]		0.29 *23*	
202.724 *5*	2.45 *8*	610.062	1$^+$	407.338	(1)$^-$	(E1)		0.0518	α(K)=0.0435 *6*; α(L)=0.00652 *10*; α(M)=0.001447 *21* α(N)=0.000335 *5*; α(O)=4.60×10^{-5} *7*; α(P)=2.13×10^{-6} *3* Mult.: α(K)exp=0.022 *8* (1965Ha24). δ(M2/E1)<0.2.
206.09 *10*	0.007 *1*	446.036	(2)$^-$	239.92	(3$^-$)	[M1,E2]		0.319 *84*	α(K)=0.244 *94*; α(L)=0.058 *8*; α(M)=0.0135 *23* α(N)=0.0031 *5*; α(O)=0.00041 *3*; α(P)=1.39×10^{-5} *68*
239.5 *2*	0.010 *2*	479.68	(1$^-$,2$^-$)	239.92	(3$^-$)	[M1,E2]		0.205 *62*	α(K)=0.161 *64*; α(L)=0.0346 *14*; α(M)=0.0080 *6* α(N)=0.00185 *12*; α(O)=0.000247 *6*; α(P)=9.2×10^{-6} *45*
239.9 *2*	0.027 *2*	239.92	(3$^-$)	0.0	2$^-$	[M1,E2]		0.204 *61*	α(K)=0.160 *63*; α(L)=0.0345 *13*; α(M)=0.0079 *6* α(N)=0.00184 *11*; α(O)=0.000245 *6*; α(P)=9.2×10^{-6} *45* E_γ,I_γ: for composite line Eγ=239.669 *15*, Iγ=0.037 *1* (1976MeZC).
295.3[#a] *3*	0.006 *4*	535.140	(1)$^-$	239.92	(3$^-$)				
300.19 *6*	0.049 *2*	446.036	(2)$^-$	145.84	(4$^-$)	[E2]		0.0713	α(K)=0.0516 *8*; α(L)=0.01522 *22*; α(M)=0.00359 *5* α(N)=0.000824 *12*; α(O)=0.0001047 *15*; α(P)=2.64×10^{-6} *4*
307.15 *10*	0.024 *5*	714.50	(0$^-$,1)	407.338	(1)$^-$	[D,E2]		0.08 *6*	
344.817 *17*	1.49 *4*	407.338	(1)$^-$	62.529	(3)$^-$	(E2)		0.0473	α(K)=0.0353 *5*; α(L)=0.00927 *13*; α(M)=0.00217 *3* α(N)=0.000499 *7*; α(O)=6.44×10^{-5} *9*; α(P)=1.85×10^{-6} *3* Mult.: α(K)exp=0.025 *9* (1965Ha24), ≤0.04 (1972Ba01).
370.3 *2*	0.0029 *6*	610.062	1$^+$	239.92	(3$^-$)				
383.501 *4*	5.58 *11*	446.036	(2)$^-$	62.529	(3)$^-$	(M1)		0.0754	α(K)=0.0634 *9*; α(L)=0.00935 *13*; α(M)=0.00208 *3* α(N)=0.000486 *7*; α(O)=7.01×10^{-5} *10*; α(P)=3.83×10^{-6} *6* Mult.: α(K)exp=0.063 *14* (1972Ba01) gives M1(+E2) with δ<0.9; but α(K)exp=0.028, α(L)exp=0.0066 (1965Ha24) suggest E2.
407.338 *3*	100.0 *20*	407.338	(1)$^-$	0.0	2$^-$	M1(+E2)	<0.6	0.060 *5*	α(K)=0.050 *5*; α(L)=0.0076 *4*; α(M)=0.00170 *8*

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γ(^{172}Tm) (continued)

E_γ[†]	I_γ[†&]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[@]	Comments
								α(N)=0.000397 *19*; α(O)=5.7×10^{-5} *4*; α(P)=3.0×10^{-6} *3* Mult.: α(K)exp=0.052 *5*, α(L)exp=0.0069 *15*, α(M)exp=0.0029 *5* (1972Ba01). α(K)exp=0.027, α(L)exp=0.0037 (1965Ha24). α(K)exp≈0.12 (1961He10).
416.8 *5*	0.021 *7*	479.68	(1$^-$,2$^-$)	62.529	(3)$^-$	[M1,E2]	0.044 *17*	α(K)=0.036 *15*; α(L)=0.0062 *13*; α(M)=0.0014 *3* α(N)=0.00033 *7*; α(O)=4.5×10^{-5} *11*; α(P)=2.12×10^{-6} *97*
446.025 *9*	7.02 *16*	446.036	(2)$^-$	0.0	2$^-$	(M1)	0.0508	α(K)=0.0428 *6*; α(L)=0.00627 *9*; α(M)=0.001393 *20* α(N)=0.000326 *5*; α(O)=4.70×10^{-5} *7*; α(P)=2.58×10^{-6} *4* Mult.: α(K)exp=0.049 *11* (1972Ba01) gives M1(+E2) with δ<0.5; but α(K)exp=0.021, α(L)exp=0.0044 (1965Ha24) suggest E2.
463.7[a]	<0.005	526.23	(0$^-$,1,2$^-$)	62.529	(3)$^-$			
472.71 *4*	0.074 *4*	535.140	(1)$^-$	62.529	(3)$^-$	[E2]	0.0198	α(K)=0.01556 *22*; α(L)=0.00328 *5*; α(M)=0.000757 *11* α(N)=0.0001750 *25*; α(O)=2.33×10^{-5} *4*; α(P)=8.52×10^{-7} *12*
475.445 *2*	2.47 *5*	475.446	(0)$^-$	0.0	2$^-$	(E2)	0.0195	α(K)=0.01534 *22*; α(L)=0.00323 *5*; α(M)=0.000743 *11* α(N)=0.0001719 *24*; α(O)=2.29×10^{-5} *4*; α(P)=8.41×10^{-7} *12* Mult.: α(K)exp≤0.026 (1972Ba01).
479.76 *10*	0.027 *3*	479.68	(1$^-$,2$^-$)	0.0	2$^-$	[M1,E2]	0.031 *12*	α(K)=0.025 *11*; α(L)=0.0042 *11*; α(M)=0.00094 *22* α(N)=0.00022 *6*; α(O)=3.06×10^{-5} *83*; α(P)=1.48×10^{-6} *66*
496.3 *3*	0.006 *3*	496.34?		0.0	2$^-$			
526.2 *4*	0.007 *5*	526.23	(0$^-$,1,2$^-$)	0.0	2$^-$	[D,E2]	0.019 *14*	
535.143 *9*	0.696 *16*	535.140	(1)$^-$	0.0	2$^-$	(M1,E2)	0.0231 *87*	α(K)=0.0191 *77*; α(L)=0.00308 *82*; α(M)=6.9×10^{-4} *18* α(N)=1.61×10^{-4} *42*; α(O)=2.27×10^{-5} *66*; α(P)=1.12×10^{-6} *49* Mult.: α(K)exp=0.014 *5* (1965Ha24), ≤0.09 (1972Ba01).
547.54[a]	<0.0007	610.062	1$^+$	62.529	(3)$^-$			
610.062 *2*	105.0 *24*	610.062	1$^+$	0.0	2$^-$	E1	0.00379	α(K)=0.00322 *5*; α(L)=0.000449 *7*; α(M)=9.91×10^{-5} *14* α(N)=2.31×10^{-5} *4*; α(O)=3.28×10^{-6} *5*; α(P)=1.724×10^{-7} *25* Mult.: α(K)exp=0.0027 *6* (1972Ba01), 0.0015 (1965Ha24).
714.45 *25*	0.004 *3*	714.50	(0$^-$,1)	0.0	2$^-$			
734.90[a]	<0.0003	797.42	(0$^-$,1)	62.529	(3)$^-$			
797.42 *10*	0.025 *1*	797.42	(0$^-$,1)	0.0	2$^-$			
^{x}831[#a]	≈0.0005							
^{x}894[#a]	≈0.003							

† From 1976MeZC (data also quoted by 1978LeZA).

‡ From ce data (1972Ba01). Data normalized to ce(K)(68γ)=63.2, 68γ assigned as M1 from L-subshell ratios. The α(exp) values are deduced (evaluator) from Ice data (1972Ba01 or 1965Ha24) and Iγ data (1976MeZC,1978LeZA). Uncertainties on α(exp) values are based on a general statement in 1972Ba01 that uncertainties on Ice values are ≤20%.

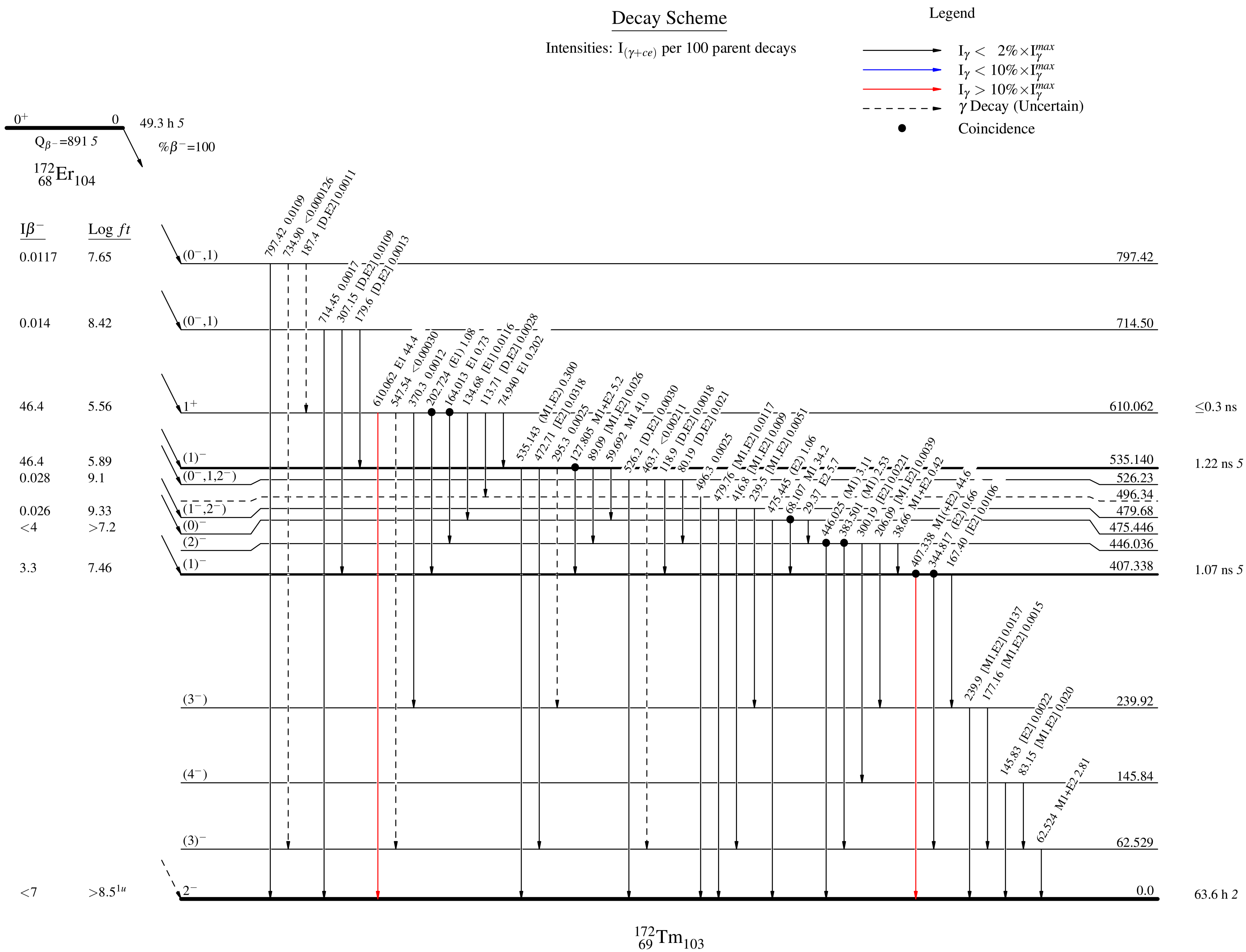
\# Assignment to ^{172}Er decay is uncertain (1976MeZC).

@ From BrIcc v2.3b (16-Dec-2014) 2008Ki07, "Frozen Orbitals" appr. When no δ value given, value overlaps listed multipolarities.

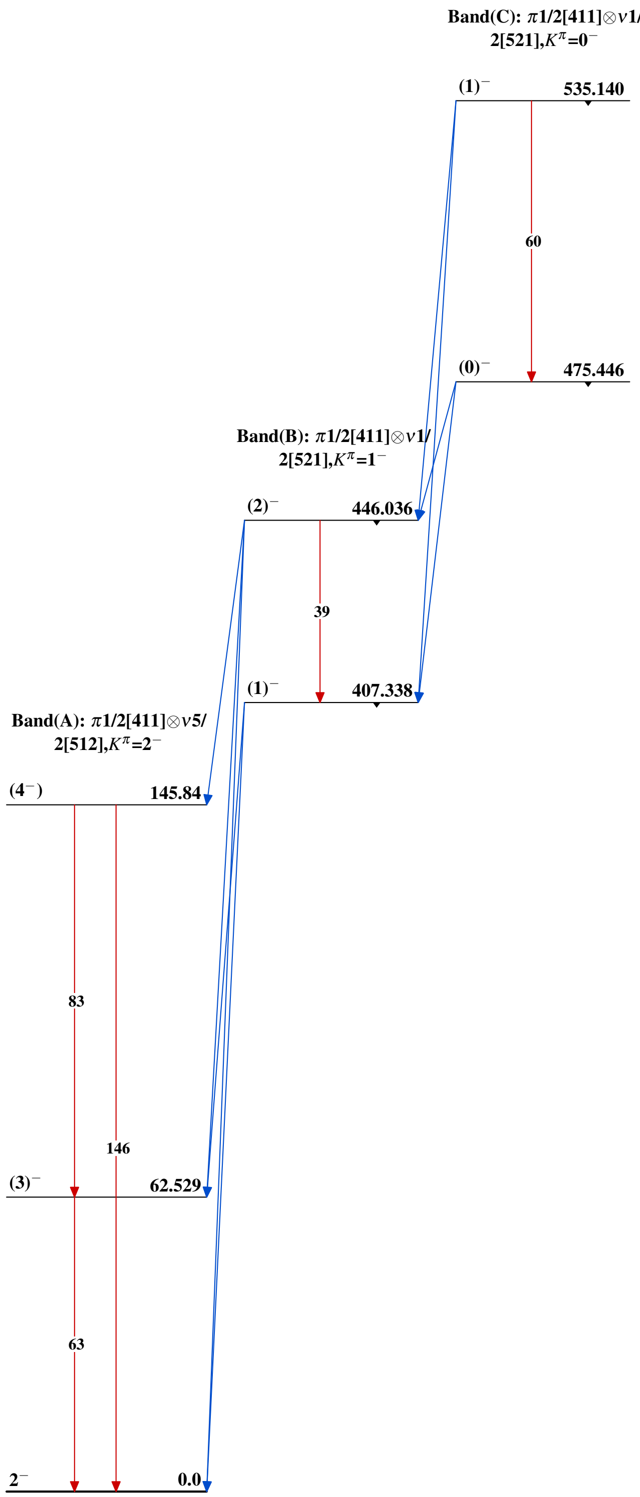
γ(^{172}Tm) (continued)

[&] For absolute intensity per 100 decays, multiply by 0.421 *15*.
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{172}Er β^- decay (49.3 h)   1976MeZC,1972Ba01



^{172}Er β^- decay (49.3 h) 1976MeZC,1972Ba01



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