^{192}Ir ε decay (73.829 d)

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 113, 1871 (2012)	15-Jun-2012

Parent: ^{192}Ir: E=0.0; $J^\pi=4^+$; $T_{1/2}$=73.829 d *11*; Q(ε)=1046.3 *24*; %ε+%$β^+$ decay=4.76 *4*

This decay has been evaluated independently by E. Browne (1999BeZQ, 1999BeZS).

See ^{192}Ir Adopted Levels for the evaluated half-life of ^{192}Ir.

The total average radiation energy released by ^{192}Ir ε decay is 49.5 keV *3* (calculated by evaluator using the computer program RADLST); this agrees well with Q xBR=49.9 keV *4* and thus confirms the completeness of the decay scheme.

The level scheme is from 1988Li06.

^{192}Os Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0.0	0^+	stable	
205.79442 *9*	2^+	288 ps *4*	$T_{1/2}$: adopted value. $T_{1/2}$=300 ps *20* from xγ(t) (1973Ch26).
489.0602 *6*	2^+	32.6 ps *+9−10*	
580.2800 *8*	4^+	14.7 ps *4*	
690.3705 *4*	3^+		
909.55 *6*	4^+	9.8 ps *4*	

† Deduced by evaluator from a least-squares fit to Eγ data.

‡ From Adopted Levels.

ε,$β^+$ radiations

A reported $β^+$ group (Eβ=240 keV *10*, %$β^+$=1.5×10^{-5} (1960An04)) is not consistent with Q+=1046.3 (2011AuZZ).

E(decay)	E(level)	Iε†	Log *ft*	Comments
(136.8 *24*)	909.55	0.094 *8*	8.97 *5*	εK=0.539 *10*; εL=0.339 *7*; εM+=0.123 *3*
(355.9 *24*)	690.3705	3.93 *6*	8.502 *11*	εK=0.7583 *6*; εL=0.1818 *5*; εM+=0.05987 *16* K-capture probability for 690.4 level: 0.70 *6* (1975Da13).
(466.0 *24*)	580.2800	0.670 *11*	9.546 *10*	εK=0.7772 *3*; εL=0.16818 *22*; εM+=0.05463 *9*

† Absolute intensity per 100 decays.

γ(^{192}Os)

Iγ normalization: from total Ti(to ^{192}Os g.s.) + total Ti(to ^{192}Pt g.s.)=100%; direct $β^-$ and ε feedings to the respective ground states are not expected (ΔJ=4). Systematics of log *ft* values for ΔJ=4, Δπ=No decays suggest a lower limit of about 22.5 (1998Si17), implying %Iβ(g.s.) and %ε(g.s.) of At most 1×10^{-11} and 5×10^{-13}%, respectively.

Principal sources of γ energy and intensity data: 1966Sc20, 1969LeZU, 1973Ge05, 1975Bo07, 1975Pr03, 1983Sc12, 1984Iw03, 1985DaZX, 1985Ei01, 1986Me07, 1987Me14, 1988Li06, 1992Si25, 1994Mi22, 2000He14.

Principal sources of ce data: 1957Ke01 (same data as 1957Ke66; note that the precision of these data appears to have been underestimated), 1960Ma17, 1964Ha06, 1964He19, 1966Sc20, 1968Bo01, 1971HeZA, 1983Ha34.

Other γ data (1966-1991): 1966Da13, 1966Ja04, 1967Pa02, 1967Sc23, 1967Sy02, 1968Bo38, 1969Re06, 1970Le03, 1970Ni12, 1970Wi08, 1971Se13, 1973Pr09, 1973Wi10, 1974Ba50, 1974He08, 1974La15, 1975Be19, 1975SiZM, 1977VyZW, 1977VyZX, 1977VyZZ, 1978He21, 1978Ke02, 1980De40, 1980Yo06, 1983Kl06, 1988Cu01.

Principal γγ(θ), ceγ(θ) studies: 1969Gr19, 1969Kh04, 1970Be08, 1974He08, 1974YaZK, 1975Be19, 1987Me14.

Nuclear orientation: 1969Re06, 1970Hi12, 1970Le04, 1971Ki13, 1985Ri07, 1985Ri13.

^{192}Ir ε decay (73.829 d) (continued)

$\gamma(^{192}Os)$ (continued)

γ-ray linear polarization (oriented nuclei): 1985Ri07, 1985Ri13.
Unplaced γ rays from ^{192}Ir β^- or ε decay are listed with ^{192}Ir β^- decay dataset only.

Summary of Os x-ray intensities (relative to I(^{192}Pt(316γ))=100):

Energy	1983Sc12	1986Me07	1992Si25	Average	%I(x ray)(Exp)	%I(x ray)(Calc)	x-ray
7.8	-	0.040 3	-	0.40 3	0.274 21		XL1
12.0	0.072 12	0.087 6	-	1.100 12	0.911 10		L x rayγ1
12.5	0.021 3	-	-				L x rayγ23
8.91						1.504 16	L x ray
63.0	2.40 7	2.46 3	2.39 8	2.444 26	2.023 22	2.07 3	Kα_1 x ray
61.5	1.39 5	1.40 2	1.40 4	1.399 22	1.158 18	1.199 16	Kα_2 x ray
71.3	0.82 4	0.80 2	0.82 3	0.808 7	0.669 6		Kβ_1' x ray
73.4	0.222 4	0.203 5	0.210 5	0.210 5	0.174 4		Kβ_2' x ray
71.4						1.504 16	Kβ x ray

Summary of relative intensity data for principal lines:

Reference	110γ	201γ	205γ	283γ	329γ	374γ
1973Ge05	0.0028 LE	0.551 12	3.86 8	0.320 8	0.019 3	0.875 15
1975Pr03	-	0.56 5	3.90 45	0.39 8x	-	0.79 3x
1983Sc12	-	0.566 11	4.02 6	0.326 4	-	0.877 14
1984Iw03 s	-	0.57 4	4.01 6	0.304 22	-	0.860 9
1985DaZX	-	-	3.982 16	-	-	
1985Ei01	0.011 4	0.62 2x	3.93 7	0.317 9	0.023 1	0.87 2
1986Me07	0.016 1	0.578 10	4.22 3x	0.321 5		0.889 7
1987Me14	-	-	-		0.019 1	-
1988Li06	0.014 2	0.581 16	4.01 10	0.315 14	0.019 6	0.875 24
1992Si15	-	0.57 2	3.98 6	0.303 9	0.033 5x	0.888 17
1994Mi22	-	-	4.055 22	-	-	
Recommended	0.0154 9	0.569 6	4.001 12	0.321 3	0.0209 7	0.878 5

Reference	420γ y	484γ	489γ y	703γ
1973Ge05	0.070 6	3.81 5	0.480 10	0.007 2
1975Pr03	-	4.10 21x	0.36 12x	
1983Sc12	0.092 6	3.86 4	0.537 10	
1984Iw03 s	0.078 9	3.828 18	0.527 9	
1985DaZX		3.867 22		
1985Ei01	0.078 4	3.62 7x	0.49 5	0.006 2
1986Me07	0.092 3	3.92 3	0.547 5	
1987Me14	-		-	0.007 2
1988Li06	0.072 8	3.77 8	0.504 13	0.0062 13
1992Si15	0.072 5	3.82 7	0.516 11	0.006 2
1994Mi22		3.899 27		
Recommended	0.083 9e	3.859 11	0.529 18e	0.0064 8

s Data Presumed To Supersede Those From 1980Yo06.
x Statistical Outlier Based On Chauvenet Criterion; Datum Excluded From Average.
y Data For This γ Are Discrepant (χ^2 Exceeds Critical Value), Even After Elimination Of Statistical Outlier Data.
z Iγ=0.0043 7 Reported By 1985Ei01 Is Presumed By The Evaluator To be α Misprint Of 0.043 7, Consistent With Branching In ε Decay.
e Weighted Average With Uncertainty Expanded To Encompass Most Precise Datum.

E_γ	I_γ[‡][a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[†]	Comments
110.33 *17*	0.0154 *9*	690.3705	3^+	580.2800	4^+	M1+E2	0.52 *+22−24*	3.96 *20*	α(K)=2.9 *4*; α(L)=0.81 *16*; α(M)=0.20 *5*; α(N+..)=0.055 *12* α(N)=0.047 *11*; α(O)=0.0076 *14*; α(P)=0.00034 *5* E_γ: unweighted average of 110.092 *19* (1969LeZU), 110.67 *30* (1985Ei01), 110.24 *30* (1988Li06). δ: from α(K)exp. α(K)exp=2.9 *4* (Ice from 1960Ma17); K:L1:L3=7:≈3:≈2 (1964Ha06). other α(K)exp: <5.2 (1966Sc20).
201.3112 *7*	0.569 *6*	690.3705	3^+	489.0602	2^+	M1+E2	−2.7 *3*	0.379 *14*	α(K)=0.224 *14*; α(L)=0.1175 *17*; α(M)=0.0293 *5*; α(N+..)=0.00817 *13* α(N)=0.00706 *11*; α(O)=0.001084 *16*; α(P)=2.27×10^{-5} *17* E_γ: revision by 1983Sh48 of datum from 1975Bo07. Others: 201.31 *7* (1966Sc20), 201.281 *20*(1973Ge05), 201.4 *3* (1985Ei01), 201.39 (1988Li06, uncertainty 0.03 to 0.3). δ: other values: −4.1 *+12−23* ($\gamma\gamma(\theta)$, 1987Me14), −4.6 *10* ($\gamma\gamma(\theta)$, 1975Be19), −3.6 *+12−22* ($\gamma\gamma(\theta)$), 1974He08); δ^2>3.7 ($\gamma(\theta$,t), 1970Hi12); 2.8 *+7−4* from α(K)exp. α(K)exp=0.222 *19*, K/L=1.9 *1*, (L1+L2)/L3=2.33 *10* (1966Sc20); K/L=1.85 *4*, L1:L2:L3=100:142 *6*:89 *7* (1957Ke01,1957Ke66).
205.79430[&] *9*	4.001 *12*	205.79442	2^+	0.0	0^+	E2		0.302	α(K)=0.1575 *22*; α(L)=0.1090 *16*; α(M)=0.0274 *4*; α(N+..)=0.00762 *11* α(N)=0.00660 *10*; α(O)=0.001000 *14*; α(P)=1.483×10^{-5} *21* Mult.: from ce subshell ratios, $\gamma\gamma(\theta)$. α(K)exp=0.142 *7*, K/L=1.52 *5*, (L1+L2)/L3=2.08 *5* (1966Sc20);

Continued on next page (footnotes at end of table)

^{192}Ir ε decay (73.829 d) (continued)

γ(^{192}Os) (continued)

E_γ	I_γ[‡a]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[†]	Comments
									L/(L+M+)=1.05 *4* (1983Ha34); L1:L2:L3=100 *4*:275 *3*:183 *3* (1964He19); L:M:N+=3.85 *30*:1:0.27 (1968Bo01); M1/M3=0.386 *35* (1971HeZA). %Iγ=3.315 *19* assuming proposed decay scheme normalization.
283.2668 *8*	0.321 *3*	489.0602	2^+	205.79442	2^+	M1+E2	−3.8 *7*	0.121 *6*	α(K)=0.080 *6*; α(L)=0.0311 *6*; α(M)=0.00767 *12*; α(N+..)=0.00215 *4* α(N)=0.00185 *3*; α(O)=0.000289 *5*; α(P)=8.2×10^{-6} *7* E_γ: revision by 1983Sh48 of datum from 1975Bo07. others: 283.30 *10* (1966Sc20), 283.255 *20*(1973Ge05), 283.2 *3* (1985Ei01), 283.34 (1988Li06, uncertainty 0.03 to 0.3). δ: from γγ(θ) (1975Be19). Other values: −1.6 *+14−34* (γγ(θ), 1974YaZK), −6 *+1−2* (γγ(θ) and γ linear polarization (oriented nuclei, 1985Ri13), −2.3 *+7−13* (γγ(θ), 1987Me14). α(K)exp=0.080 *7* (1966Sc20).
329.09 *15*	0.0209 *7*	909.55	4^+	580.2800	4^+	M1+E2	−1.51 *+13−22*	0.110 *8*	α(K)=0.083 *7*; α(L)=0.0202 *6*; α(M)=0.00484 *12*; α(N+..)=0.00137 *4* α(N)=0.00117 *3*; α(O)=0.000191 *6*; α(P)=9.2×10^{-6} *8* E_γ: weighted average of 329.13 *20* (1973Ge05), 328.8 *3* (1985Ei01) and 329.3 *3* (1988Li06). Mult.: from Adopted Gammas. D+Q from γγ(θ) (1985Ri13). δ: magnitude from ^{192}Os Adopted Gammas; sign from δ=−7 *+4−15* from γγ(θ) and γ-ray linear polarization (oriented nuclei) (1985Ri13).
374.4852 *8*	0.878 *5*	580.2800	4^+	205.79442	2^+	E2		0.0484	α(K)=0.0339 *5*; α(L)=0.01106 *16*; α(M)=0.00270 *4*; α(N+..)=0.000759 *11* α(N)=0.000653 *10*; α(O)=0.0001031 *15*; α(P)=3.51×10^{-6} *5* E_γ: revision by 1983Sh48 of datum from 1975Bo07. others: 374.55 *14* (1966Sc20),

Continued on next page (footnotes at end of table)

^{192}Ir ε decay (73.829 d) (continued)

γ(^{192}Os) (continued)

E_γ	I_γ ‡ a	E_i(level)	J_i^π	E_f	J_f^π	Mult. #	δ @	α †	Comments
									374.472 *25*(1973Ge05), 374.4 *3* (1985Ei01), 374.52 (1988Li06, uncertainty 0.03 to 0.3). Mult.: from α(L)exp and (L1+L2)/L3 subshell ratio. α(L)exp=0.0116 *6*, (L1+L2)/L3=3.8 *2* (1966Sc20).
420.51 *6*	0.083 *9*	909.55	4+	489.0602	2+	(E2)		0.0354	α(K)=0.0256 *4*; α(L)=0.00749 *11*; α(M)=0.00182 *3*; α(N+..)=0.000512 *8* α(N)=0.000439 *7*; α(O)=7.00×10^{-5} *10*; α(P)=2.68×10^{-6} *4* E_γ: weighted average of 420.50 *6* (1973Ge05), 420.6 *3* (1985Ei01) and 420.6 *3* (1988Li06). Mult.: from Adopted Gammas.
484.5751 & *4*	3.859 *11*	690.3705	3+	205.79442	2+	M1+E2	−5.9 *2*	0.0259	α(K)=0.0195 *3*; α(L)=0.00489 *7*; α(M)=0.001174 *17*; α(N+..)=0.000332 *5* α(N)=0.000284 *4*; α(O)=4.60×10^{-5} *7*; α(P)=2.08×10^{-6} *3* I_γ: deduced from total Iγ=3.859 *11* for 484.6γ+485.3γ(^{192}Pt) and Iγ(485.3γ)=0.0023 *5*. δ: other data: −6.5 *4* (γγ(θ), 1987Me14), −5.8 *8* (γ(θ,t), 1970Hi12), −10 *1* (γγ(θ, 1975Be19), −7.6 *+11−14* (γγ(θ), 1974He08), −5.1 *5* (γγ(θ), 1974YaZK), −7.6 *+13−24* (γγ(θ), 1970Be08), −10.9 *+15−21* (γγ(θ), 1969Gr19), −10 *+3−10* (γγ(θ), 1969Kh04), 7.4 (from α(K)exp). α(K)exp=0.0191 *7* for doublet dominated by this transition; K/L=3.8 *3*, (L1+L2)/L3=7.6 *9* (1966Sc20).
489.06 *3*	0.529 *18*	489.0602	2+	0.0	0+	E2		0.0241	α(K)=0.0180 *3*; α(L)=0.00463 *7*; α(M)=0.001113 *16*; α(N+..)=0.000315 *5* α(N)=0.000269 *4*; α(O)=4.35×10^{-5} *6*; α(P)=1.91×10^{-6} *3* E_γ: weighted average of 489.05 *7* (1966Sc20) and 489.06 *3* (1973Ge05). others: 489.06 *30* (1985Ei01) and 489.05 (1988Li06, uncertainty 0.03 to 0.3). α(K)exp=0.0192 *21* (1966Sc20). %Iγ=0.438 *15* assuming proposed decay scheme normalization.
703.78 *19*	0.0064 *8*	909.55	4+	205.79442	2+	(E2)		0.01031	α(K)=0.00816 *12*; α(L)=0.001651 *24*; α(M)=0.000388 *6*; α(N+..)=0.0001108 *16* α(N)=9.43×10^{-5} *14*; α(O)=1.562×10^{-5} *22*;

Continued on next page (footnotes at end of table)

^{192}Ir ε decay (73.829 d) (continued)

$\gamma(^{192}Os)$ (continued)

E_γ	E_i(level)	Comments
		α(P)=8.76×10^{-7} *13* E_γ: weighted average of 703.7 *4* (1973Ge05), 703.6 *3* (1985Ei01) and 704.0 *3* (1988Li06). Mult.: from Adopted Gammas.

† Additional information 1.

‡ Data from 1994Mi22, 1992Si25, 1988Li06, 1987Me14, 1986Me07, 1985DaZX, 1985Ei01, 1984Iw03, 1983Sc12, 1975Pr03, 1973Ge05 are tabulated above. The recommended values are weighted averages of these data, excluding data given As limits or identified As statistical outliers based on the Chauvenet criterion, except As noted. note that most data from 1975Pr03 are identified as outliers.

From α(K)exp, except where noted. Conversion coefficient values attributed to 1966Sc20 were calculated by the evaluator from Iγ given here and Ice from 1966Sc20; the photon and ce intensity scales were normalized assuming α(K)(E2 theory)=0.0535 for 316.5γ(^{192}Pt).

@ From γ-ray linear polarization (oriented nuclei) (1985Ri13), except where noted. Data of 1985Ri13 supersede those of 1985Ri07.

& From 2000He14, based on a revised energy scale that uses the new fundamental constants and wave lengths from an updated value of the Si crystal lattice spacing (1987Co39). 2000He14 fitted the revised γ-ray energies to a level scheme. Their recommended γ-ray energies are from level-energy differences corrected for recoil. see 1999He26 for discussion of improvement of ^{192}Ir calibration energies by use of a self-calibration procedure.

a For absolute intensity per 100 decays, multiply by 0.828 *7*.

^{192}Ir ε decay (73.829 d)

Decay Scheme

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