^{189}Re β^- decay (24.3 h) 1973Ho27,1979Sa18

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson, Balraj Singh	NDS 142, 1 (2017)	15-Apr-2017

Parent: ^{189}Re: E=0.0; J$^\pi$=5/2$^+$; $T_{1/2}$=24.3 h *4*; Q(β^-)=1008 *8*; %β^- decay=100.0

^{189}Re-J$^\pi$,$T_{1/2}$: From ^{189}Re Adopted Levels.

^{189}Re-Q(β^-): From 2017Wa10. Other: Q(β^-)=924 *10* for measured mass excess(^{189}Re)=−38063 *10* (2013Sh30) and mass excess(^{189}Os)=−38986.7 *7* (2017Wa10).

1973Ho27: measured Eγ, Iγ, $\gamma\gamma$-coin.

1979Sa18: measured Eγ, Iγ, I(ce), $\gamma\gamma$-coin, $\beta\gamma$-coin.

Others: 1965Bl06, 1963Cr06.

^{189}Os Levels

E(level)	J$^\pi$	$T_{1/2}$	E(level)	J$^\pi$	E(level)	J$^\pi$
0.0	3/2$^-$		219.399 *25*	7/2$^-$	498.78 *5*	1/2$^-$,3/2$^-$
30.82 *4*	9/2$^-$	5.81 h *10*	233.54 *3*	5/2$^-$	549.89 *6*	3/2$^-$
36.21 *3*	1/2$^-$		275.90 *3*	5/2$^-$	599.57 *4*	3/2$^-$
69.551 *22*	5/2$^-$		365.77 *5*	7/2$^-$	621.97 *11*	(3/2$^-$,5/2$^-$)
95.269 *10*	3/2$^-$		427.93 *4*	5/2$^-$,7/2$^-$	672.18 *8*	5/2$^-$
216.68 *3*	7/2$^-$		438.67 *6*	1/2$^-$,3/2$^-$	716.82 *5*	5/2$^-$

β^- radiations

E(decay)	E(level)	Iβ^- †	Log *ft*	Comments
(291 *8*)	716.82	0.32 *8*	7.6 *1*	av Eβ=81.6 *25*
(336 *8*)	672.18	0.045 *13*	8.7 *1*	av Eβ=95.5 *26*
(386 *8*)	621.97	0.016 *5*	9.3 *2*	av Eβ=111.5 *26*
(408 *8*)	599.57	1.3 *2*	7.5 *1*	av Eβ=118.8 *27*
(458 *8*)	549.89	0.24 *5*	8.4 *1*	av Eβ=135.2 *27*
(509 *8*)	498.78	0.32 *6*	8.4 *1*	av Eβ=152.4 *28*
(580 *8*)	427.93	0.20 *4*	8.8 *1*	av Eβ=176.8 *28*
(642‡ *8*)	365.77	<0.03	>9.8	av Eβ=198.7 *29*
(732 *8*)	275.90	5.6 *10*	7.6 *1*	av Eβ=231.1 *30* E(decay): 725 *30* from 1963Cr06.
(774 *8*)	233.54	0.21 *4*	9.2 *1*	av Eβ=246.7 *30*
(789 *8*)	219.399	7.4 *13*	7.7 *1*	av Eβ=251.9 *30* E(decay): see comment on β to 217 level.
(791 *8*)	216.68	13 *2*	7.4 *1*	av Eβ=252.9 *30* E(decay): Eβ=800 *20* (1965Bl06), Eβ=780 *20* (1963Cr06) to the 217+219 levels.
(913‡ *8*)	95.269	<5	>8.1	av Eβ=298.6 *31*
(938‡ *8*)	69.551	<4	>8.2	av Eβ=308.4 *31*
(972 *8*)	36.21	2.6 *16*	8.9^{1u} *3*	av Eβ=323.7 *30*
(977 *8*)	30.82	3.9 *23*	8.8^{1u} *3*	av Eβ=325.7 *30* Iβ^-: from the intensity balance through the 30.8 level assuming no direct β feeding. Note that for log $f^{1u}t$>8.5, Iβ<6%.
(1008 *8*)	0.0	62 *7*	7.1 *1*	av Eβ=335.2 *31* Iβ^-: other measured values: 60 *20* (1965Bl06), 58 *25* (1963Cr06). E(decay): 1015 *20* from 1965Bl06, other value: 1000 *50* (1963Cr06).

† Absolute intensity per 100 decays.

‡ Existence of this branch is questionable.

$\gamma(^{189}Os)$

Iγ normalization: From weighted average of Iγ(186γ+189γ)=0.025 *10*, Iγ(217γ+219γ)=0.11 *3*, and Iγ(245γ)=0.04 *2* for γ-ray singles per ^{189}Re β; and Iγ(217γ+219γ)=0.09 *3* from $\beta\gamma$ coincidences (1963Cr06).

Experimental conversion coefficients from 1963Cr06, 1965Bl06, and 1979Sa18 assuming α(K)exp(185.9γ)=0.49.

E_γ[†]	I_γ[†d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡]	α[c]	$I_{(\gamma+ce)}$[d]	Comments
25.65 *10*	0.035[&] *13*	95.269	3/2⁻	69.551	5/2⁻	M1+E2	0.11 *+5−3*	1.3×10³ *13*		α(L)=1.02×10³ *98*; α(M)=2.6×10² *25* α(N)=61 *59*; α(O)=9.0 *86*; α(P)=0.0217 *78* E_γ: from ^{189}Ir ε decay (1970Ma37). Included here for completeness.
30.82 *5*		30.82	9/2⁻	0.0	3/2⁻	M3+E4	0.04 *2*	3.12×10⁵ *10*	227 *39*	M1/M3=0.32 *5* (1963Cr06) ce(L)/(γ+ce)=0.707 *19*; ce(M)/(γ+ce)=0.227 *11* ce(N)/(γ+ce)=0.057 *3*; ce(O)/(γ+ce)=0.0085 *5*; ce(P)/(γ+ce)=0.000152 *6* α(L)=2.20×10⁵ *6*; α(M)=7.1×10⁴ *4* α(N)=1.78×10⁴ *9*; α(O)=2.65×10³ *10*; α(P)=47.4 *8* E_γ: weighted average of values from β-decay (1962Cr02) by measurement of the conversion electrons. $I_{(\gamma+ce)}$: from ce(M3)(30.8γ)/ce(L3)(69.5γ)=550 *60*/465 *10* measured in equilibrium. The indirect feeding into the 30.8 level is I(γ+ce)=5.6 *4*. δ: <0.09 from M1/M3 in β^- decay.
33.31 *4*	0.027[&] *3*	69.551	5/2⁻	36.21	1/2⁻	E2		723		α(L)=546 *9*; α(M)=138.5 *21* α(N)=33.0 *5*; α(O)=4.83 *8*; α(P)=0.00382 *6* I_γ: referred from ε decay, the ratio of 0.113:59 (in ε) or 0.027:14.0 (in β^-decay). E_γ: From ^{189}Ir ε decay (1970Ma37). Included here for completeness.
36.17[#] *5*	4.3 *13*	36.21	1/2⁻	0.0	3/2⁻	M1+E2	0.046 *5*	20.2 *4*		α(L1)exp=13.8 *+67−44* (1973Ho27) α(L)=15.6 *3*; α(M)=3.60 *7* α(N)=0.877 *17*; α(O)=0.150 *3*; α(P)=0.01064 *16* δ: other: <0.8 from ce data in β^-.
56.50[@] *4*	1.23 *12*	275.90	5/2⁻	219.399	7/2⁻	M1		5.17		α(L)=3.99 *6*; α(M)=0.916 *13* α(N)=0.224 *4*; α(O)=0.0386 *6*; α(P)=0.00287 *4*
59.1[#] *1*	1.7[a] *6*	95.269	3/2⁻	36.21	1/2⁻	M1+E2	0.085 *10*	4.81 *10*		α(L)=3.71 *8*; α(M)=0.857 *19* α(N)=0.209 *5*; α(O)=0.0357 *7*; α(P)=0.00250 *4*
59.1 *1*	≈0.5[a]	275.90	5/2⁻	216.68	7/2⁻	(M1+E2)	≈0.9	≈22.0		L1/L2≈5 (1962Ha24) α(L)≈16.6; α(M)≈4.20 α(N)≈1.007; α(O)≈0.1504; α(P)≈0.001543

$^{189}_{76}Os_{113}$-2

$\gamma(^{189}Os)$ (continued)

E_γ[†]	I_γ[†d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡]	α[c]	Comments
69.54 4	14.0 5	69.551	5/2⁻	0.0	3/2⁻	M1+E2	+0.683 25	8.2 3	E_γ: note that this transition is not confirmed in (n,γ), $\gamma\gamma$ coin measurements. α(L2)exp=2.55 +26−24 (1973Ho27) α(L)=6.25 23; α(M)=1.56 6 α(N)=0.375 14; α(O)=0.0572 20; α(P)=0.00113 3 L1:L2:L3:M1:M2:M3=367 20:470 20:465 10:52 20:108 15:115 15. δ: other: +0.62 +11−9 in β^- decay.
[x]90.0[@] 1	0.31 12								
95.27 1	0.55 6	95.269	3/2⁻	0.0	3/2⁻	M1+E2	+0.32 2	6.36	L12:L3=63 30:32 24 (1963Cr06); α(K)exp=6.5 25 (1979Sa18) α(L1)exp=0.82 +145−53 (1973Ho27) α(K)=4.92 9; α(L)=1.10 3; α(M)=0.261 8 α(N)=0.0634 19; α(O)=0.0105 3; α(P)=0.000577 10 δ: other: +0.3 +5−1 from β^- decay.
101.1[@] 5	0.06[b] 3	599.57	3/2⁻	498.78	1/2⁻,3/2⁻	M1		5.45 11	α(K)=4.50 9; α(L)=0.733 15; α(M)=0.168 4 α(N)=0.0411 9; α(O)=0.00709 15; α(P)=0.000527 11 α(K)exp=5.7 18 (1979Sa18)
117.27[@] 5	0.18 6	716.82	5/2⁻	599.57	3/2⁻	M1		3.56	α(K)=2.94 5; α(L)=0.478 7; α(M)=0.1097 16 α(N)=0.0268 4; α(O)=0.00463 7; α(P)=0.000344 5 α(K)exp=4.5 13 (1979Sa18)
[x]118.60[@] 5	0.12 6								
121.39[#] 5	0.53 6	216.68	7/2⁻	95.269	3/2⁻	[E2]		2.02	α(K)=0.567 8; α(L)=1.098 16; α(M)=0.280 4 α(N)=0.0672 10; α(O)=0.00996 14; α(P)=5.30×10^{-5} 8
124.14[#] 5	0.53 6	219.399	7/2⁻	95.269	3/2⁻	[E2]		1.85	α(K)=0.541 8; α(L)=0.991 14; α(M)=0.253 4 α(N)=0.0607 9; α(O)=0.00900 13; α(P)=5.03×10^{-5} 7
132.28[@] 5	0.086 25	365.77	7/2⁻	233.54	5/2⁻	[M1]		2.53	α(K)=2.09 3; α(L)=0.339 5; α(M)=0.0777 11 α(N)=0.0190 3; α(O)=0.00328 5; α(P)=0.000244 4
138.24[@] 5	0.45 4	233.54	5/2⁻	95.269	3/2⁻	M1+E2	−0.8 2	1.84 13	α(K)=1.29 18; α(L)=0.42 4; α(M)=0.102 11 α(N)=0.025 3; α(O)=0.0039 4; α(P)=0.000146 23
147.09[#] 5	22.6 6	216.68	7/2⁻	69.551	5/2⁻	M1+E2	−1.0 +4−3	1.43 21	α(K)exp=0.94 20 (1973Ho27) α(K)=0.96 28; α(L)=0.36 5; α(M)=0.088 15 α(N)=0.021 4; α(O)=0.0033 5; α(P)=1.07×10^{-4} 35 Additional information 1.
149.84 5	14.3 3	219.399	7/2⁻	69.551	5/2⁻	E2		0.917	α(K)=0.352 5; α(L)=0.426 6; α(M)=0.1083 16 α(N)=0.0260 4; α(O)=0.00388 6; α(P)=3.21×10^{-5} 5 α(K)exp=0.75 32 (1973Ho27)
152.03[@] 5	0.47 4	427.93	5/2⁻,7/2⁻	275.90	5/2⁻				
160.93[@] 5	0.51 6	599.57	3/2⁻	438.67	1/2⁻,3/2⁻	M1		1.451	α(K)=1.199 17; α(L)=0.194 3; α(M)=0.0445 7 α(N)=0.01086 16; α(O)=0.00188 3; α(P)=0.0001396 20 α(K)exp=1.9 3 (1979Sa18)

From ENSDF

γ(^{189}Os) (continued)

E_γ[†]	I_γ[†d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡]	α[c]	Comments
164.02[@] 5	0.38 4	233.54	5/2$^-$	69.551	5/2$^-$	M1+E2	<1.7	1.1 3	α(K)=0.82 32; α(L)=0.22 4; α(M)=0.053 12 α(N)=0.013 3; α(O)=0.0021 4; α(P)=9.3×10^{-5} 40
166.95[@] 5	0.14 3	716.82	5/2$^-$	549.89	3/2$^-$	E2(+M1)	>2	0.69 7	α(K)=0.35 9; α(L)=0.256 10; α(M)=0.065 3 α(N)=0.0155 7; α(O)=0.00235 8; α(P)=3.5×10^{-5} 11 α(K)exp=0.35 14 (1979Sa18)
[x]175.1[f] 5	0.5 2								E_γ: observed only by 1973Ho27. Inspection of the spectrum indicates that this transition may be the same as one identified at 180.7 in 1979Sa18.
180.67[@] 5	0.35 4	275.90	5/2$^-$	95.269	3/2$^-$	M1+E2	>0.2	0.75 28	α(K)=0.53 31; α(L)=0.165 24; α(M)=0.040 8 α(N)=0.0097 18; α(O)=0.00155 19; α(P)=5.9×10^{-5} 39 E_γ: see comment on 175.1γ.
185.89 5	34.3 7	216.68	7/2$^-$	30.82	9/2$^-$	M1+E2	<0.5	0.91 6	α(K)=0.74 6; α(L)=0.133 5; α(M)=0.0309 14 α(N)=0.0075 4; α(O)=0.00128 4; α(P)=8.6×10^{-5} 8 K:L1:L3=194 25:37 13:14 12 (1963Cr06,1965Bl06) α(K)exp=0.83 11 (1973Ho27)
188.53 9	9.06 18	219.399	7/2$^-$	30.82	9/2$^-$	M1+E2	1.5 +10−4	0.57 9	α(K)exp=1.0 3 (1973Ho27) α(K)=0.374 98; α(L)=0.147 6; α(M)=0.0363 20 α(N)=0.0088 5; α(O)=0.00137 5; α(P)=4.0×10^{-5} 12 δ: other: <0.6 from β^- decay.
197.33 5	1.97 6	233.54	5/2$^-$	36.21	1/2$^-$	E2		0.347	α(K)=0.1757 25; α(L)=0.1299 19; α(M)=0.0328 5 α(N)=0.00788 11; α(O)=0.001191 17; α(P)=1.643×10^{-5} 23
206.36 5	1.21 16	275.90	5/2$^-$	69.551	5/2$^-$	M1+E2	>1.9	0.34 5	α(K)=0.20 5; α(L)=0.1066 20; α(M)=0.0266 7 α(N)=0.00640 16; α(O)=0.000983 16; α(P)=2.07×10^{-5} 60
211.26[@] 5	0.25 4	427.93	5/2$^-$,7/2$^-$	216.68	7/2$^-$	E2(+M1)	>1	0.38 10	α(K)=0.25 11; α(L)=0.0959 24; α(M)=0.0236 11 α(N)=0.00570 23; α(O)=0.000892 14; α(P)=2.7×10^{-5} 13 K/(L1+L2)≈2.4 (1965Bl06).
216.69 7	100.0 25	216.68	7/2$^-$	0.0	3/2$^-$	E2		0.254	α(K)=0.1376 20; α(L)=0.0881 13; α(M)=0.0221 4 α(N)=0.00532 8; α(O)=0.000809 12; α(P)=1.307×10^{-5} 19 α(L1)exp=0.047 25 (1973Ho27)
218[@] 1	0.6[b] 3	716.82	5/2$^-$	498.78	1/2$^-$,3/2$^-$	[M1]		0.621 12	α(K)=0.514 10; α(L)=0.0826 16; α(M)=0.0189 4 α(N)=0.00463 9; α(O)=0.000799 16; α(P)=5.96×10^{-5} 12
219.40 5	82.5 18	219.399	7/2$^-$	0.0	3/2$^-$	E2		0.244	α(K)=0.1332 19; α(L)=0.0837 12; α(M)=0.0210 3 α(N)=0.00506 7; α(O)=0.000769 11; α(P)=1.268×10^{-5} 18 α(K)exp=0.127 33 (1973Ho27)
(222.84 8)	0.14 3	498.78	1/2$^-$,3/2$^-$	275.90	5/2$^-$				E_γ,I_γ: from Adopted Gammas, based on (n,γ) E=thermal data. It is possible that an unplaced Eγ=223.80 5 with Iγ=0.37 12 corresponds to the γ

γ(^{189}Os) (continued)

E_γ[†]	I_γ[†d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡]	α[c]	Comments
									ray seen in (n,γ), although energy deviation of ≈1 keV seems quite large in view of quoted low uncertainties.
[x]223.80[@] 5	0.37 12								
233.6 1	1.29 6	233.54	5/2$^-$	0.0	3/2$^-$	M1+E2	1.7 +6−3	0.28 4	α(K)=0.19 3; α(L)=0.0657 10; α(M)=0.01609 24 α(N)=0.00389 6; α(O)=0.000613 11; α(P)=2.1×10^{-5} 4
239.7[@] 1	0.25 6	275.90	5/2$^-$	36.21	1/2$^-$	[E2]		0.183	α(K)=0.1057 15; α(L)=0.0585 9; α(M)=0.01464 21 α(N)=0.00352 5; α(O)=0.000539 8; α(P)=1.021×10^{-5} 15
245.09[#] 10	64 8	275.90	5/2$^-$	30.82	9/2$^-$	E2		0.1704	α(K)=0.0997 14; α(L)=0.0536 8; α(M)=0.01338 19 α(N)=0.00322 5; α(O)=0.000493 7; α(P)=9.67×10^{-6} 14 α(K)exp=0.137 63 (1973Ho27)
256.2[@] 1	0.12 3	621.97	(3/2$^-$,5/2$^-$)	365.77	7/2$^-$	[M1+E2]		0.27 13	α(K)=0.21 12; α(L)=0.049 4; α(M)=0.0117 5 α(N)=0.00283 14; α(O)=0.00046 5; α(P)=2.3×10^{-5} 15
265.2[@] 1	0.33 5	498.78	1/2$^-$,3/2$^-$	233.54	5/2$^-$				
270.6[@] 1	0.172 18	365.77	7/2$^-$	95.269	3/2$^-$	[E2]		0.1249	α(K)=0.0770 11; α(L)=0.0363 6; α(M)=0.00903 13 α(N)=0.00218 3; α(O)=0.000336 5; α(P)=7.60×10^{-6} 11
273.6[@] 5	0.15 3	549.89	3/2$^-$	275.90	5/2$^-$	[M1]		0.332	α(K)=0.275 4; α(L)=0.0440 7; α(M)=0.01009 15 α(N)=0.00246 4; α(O)=0.000426 7; α(P)=3.18×10^{-5} 5 E_γ: 1973Ho27 report a 275.8 8 which may be this transition, although the large mismatch makes this unlikely.
275.9 1	5.6 3	275.90	5/2$^-$	0.0	3/2$^-$	M1+E2	1.8 2	0.167 10	α(K)=0.119 9; α(L)=0.0359 7; α(M)=0.00873 14 α(N)=0.00211 4; α(O)=0.000336 7; α(P)=1.29×10^{-5} 11
296.0[@] 1	0.49 12	365.77	7/2$^-$	69.551	5/2$^-$	[M1]		0.268	α(K)=0.222 4; α(L)=0.0355 5; α(M)=0.00813 12 α(N)=0.00199 3; α(O)=0.000343 5; α(P)=2.57×10^{-5} 4
306.6[@] 5	0.12[b] 6	672.18	5/2$^-$	365.77	7/2$^-$	[M1+E2]		0.165 80	α(K)=0.129 74; α(L)=0.027 5; α(M)=0.0065 9 α(N)=0.00158 23; α(O)=0.00026 6; α(P)=1.45×10^{-5} 89
323.7[@] 1	0.18 6	599.57	3/2$^-$	275.90	5/2$^-$	[M1]		0.211	α(K)=0.1745 25; α(L)=0.0278 4; α(M)=0.00637 9 α(N)=0.001556 22; α(O)=0.000269 4; α(P)=2.01×10^{-5} 3
[x]332.9[@] 1	0.31 12								
343.5[@] 1	0.80 12	438.67	1/2$^-$,3/2$^-$	95.269	3/2$^-$				
351.1[@] 1	0.6 3	716.82	5/2$^-$	365.77	7/2$^-$	[M1]		0.1692	α(K)=0.1403 20; α(L)=0.0223 4; α(M)=0.00511 8 α(N)=0.001247 18; α(O)=0.000216 3; α(P)=1.614×10^{-5} 23
366.1 1	0.74 6	599.57	3/2$^-$	233.54	5/2$^-$				
380.2[@] 1	0.43 12	599.57	3/2$^-$	219.399	7/2$^-$	[E2]		0.0464	α(K)=0.0326 5; α(L)=0.01050 15; α(M)=0.00256 4 α(N)=0.000619 9; α(O)=9.79×10^{-5} 14; α(P)=3.38×10^{-6} 5
382.8[@] 1	0.61 12	599.57	3/2$^-$	216.68	7/2$^-$	[E2]		0.0456	α(K)=0.0321 5; α(L)=0.01026 15; α(M)=0.00250 4 α(N)=0.000605 9; α(O)=9.57×10^{-5} 14; α(P)=3.33×10^{-6} 5
388.3[@] 4	0.12 6	621.97	(3/2$^-$,5/2$^-$)	233.54	5/2$^-$	[M1+E2]		0.087 43	α(K)=0.069 39; α(L)=0.0134 37; α(M)=0.0031 8 α(N)=0.00076 19; α(O)=1.28×10^{-4} 37; α(P)=7.8×10^{-6} 46
397.0 1	1.88 18	427.93	5/2$^-$,7/2$^-$	30.82	9/2$^-$				

$^{189}_{76}$Os$_{113}$-5

γ(^{189}Os) (continued)

E_γ[†]	I_γ[†d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[c]	Comments
402.6[@] *3*	0.12 *6*	438.67	1/2⁻,3/2⁻	36.21	1/2⁻			
403.6 *1*	1.35 *12*	498.78	1/2⁻,3/2⁻	95.269	3/2⁻			
428.8 *5*	0.86 *18*	427.93	5/2⁻,7/2⁻	0.0	3/2⁻			α(K)=0.0244 *4*; α(L)=0.00702 *11*; α(M)=0.001702 *25* α(N)=0.000411 *6*; α(O)=6.57×10^{-5} *10*; α(P)=2.57×10^{-6} *4*
428.8 *5*	1.11 *18*	498.78	1/2⁻,3/2⁻	69.551	5/2⁻			
[x]432.0[@] *8*	0.19 *12*							
438.50[e@] *10*	0.38[e] *12*	672.18	5/2⁻	233.54	5/2⁻	[M1+E2]	0.063 *31*	α(K)=0.050 *28*; α(L)=0.0094 *29*; α(M)=0.00220 *62* α(N)=5.3×10^{-4} *16*; α(O)=9.0×10^{-5} *29*; α(P)=5.7×10^{-6} *33*
438.8[e@] *8*	0.055[e&] *20*	438.67	1/2⁻,3/2⁻	0.0	3/2⁻			
441.2 *5*	0.12 *6*	716.82	5/2⁻	275.90	5/2⁻			I_γ: from 1979Sa18. Other value: 2.4 *3* from 1973Ho27 is inconsistent with the spectrum of 1979Sa18 and presumably includes an impurity.
(452.91 *10*)	0.26 *9*	672.18	5/2⁻	219.399	7/2⁻	[M1+E2]	0.058 *29*	α(K)=0.046 *25*; α(L)=0.0086 *27*; α(M)=0.00200 *58* α(N)=4.9×10^{-4} *15*; α(O)=8.2×10^{-5} *27*; α(P)=5.2×10^{-6} *30*
454.7 *2*	2.8 *5*	549.89	3/2⁻	95.269	3/2⁻	M1	0.0851	α(K)=0.0707 *10*; α(L)=0.01115 *16*; α(M)=0.00255 *4* α(N)=0.000623 *9*; α(O)=0.0001077 *16*; α(P)=8.09×10^{-6} *12* α(K)exp=0.09 *4* (1979Sa18)
462.6[@] *1*	2.58 *6*	498.78	1/2⁻,3/2⁻	36.21	1/2⁻	M1	0.0813	α(K)=0.0675 *10*; α(L)=0.01065 *15*; α(M)=0.00244 *4* α(N)=0.000595 *9*; α(O)=0.0001029 *15*; α(P)=7.73×10^{-6} *11* α(K)exp=0.08 *3* (1979Sa18)
480.4[@] *1*	0.55 *18*	549.89	3/2⁻	69.551	5/2⁻	M1	0.0736	α(K)=0.0612 *9*; α(L)=0.00963 *14*; α(M)=0.00220 *3* α(N)=0.000538 *8*; α(O)=9.31×10^{-5} *13*; α(P)=6.99×10^{-6} *10* α(K)exp=0.055 *25* (1979Sa18)
483.2[@] *1*	0.68 *18*	716.82	5/2⁻	233.54	5/2⁻	[M1]	0.0725	α(K)=0.0602 *9*; α(L)=0.00949 *14*; α(M)=0.00217 *3* α(N)=0.000530 *8*; α(O)=9.16×10^{-5} *13*; α(P)=6.89×10^{-6} *10*
497.3 *1*	2.3 *6*	716.82	5/2⁻	219.399	7/2⁻			
498.8[@] *1*	1.29 *12*	498.78	1/2⁻,3/2⁻	0.0	3/2⁻	M1	0.0667	α(K)=0.0554 *8*; α(L)=0.00872 *13*; α(M)=0.00199 *3* α(N)=0.000487 *7*; α(O)=8.42×10^{-5} *12*; α(P)=6.33×10^{-6} *9* α(K)exp=0.095 *35* (1979Sa18) E_γ: 1973Ho27 report a γ of 496.8 keV *8* which may correspond to this transition, although a large mismatch makes this unlikely.
504.1 *1*	4.5 *4*	599.57	3/2⁻	95.269	3/2⁻	M1	0.0649	α(K)=0.0539 *8*; α(L)=0.00848 *12*; α(M)=0.00194 *3* α(N)=0.000474 *7*; α(O)=8.19×10^{-5} *12*; α(P)=6.16×10^{-6} *9* α(K)exp=0.050 *18* (1979Sa18)
530.3 *3*	1.05 *6*	599.57	3/2⁻	69.551	5/2⁻	M1	0.0569	α(K)=0.0473 *7*; α(L)=0.00742 *11*; α(M)=0.001697 *24* α(N)=0.000414 *6*; α(O)=7.17×10^{-5} *10*; α(P)=5.39×10^{-6} *8* α(K)exp=0.058 *40* (1979Sa18)
550.0[@] *3*	0.68 *6*	549.89	3/2⁻	0.0	3/2⁻	M1	0.0517	α(K)=0.0430 *6*; α(L)=0.00674 *10*; α(M)=0.001542 *22* α(N)=0.000376 *6*; α(O)=6.51×10^{-5} *10*; α(P)=4.90×10^{-6} *7* α(K)exp=0.058 *40* (1979Sa18)
563.4 *1*	9.0 *5*	599.57	3/2⁻	36.21	1/2⁻	M1	0.0486	α(K)=0.0404 *6*; α(L)=0.00633 *9*; α(M)=0.001447 *21*

$^{189}_{76}$Os$_{113}$-6

γ(^{189}Os) (continued)

E_γ †	I_γ †d	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α c	Comments
								α(N)=0.000353 *5*; α(O)=6.11×10^{-5} *9*; α(P)=4.60×10^{-6} *7* α(K)exp=0.032 *10* (1979Sa18)
599.6 *1*	5.1 *4*	599.57	3/2$^-$	0.0	3/2$^-$	M1	0.0413	α(K)=0.0344 *5*; α(L)=0.00538 *8*; α(M)=0.001229 *18* α(N)=0.000300 *5*; α(O)=5.19×10^{-5} *8*; α(P)=3.91×10^{-6} *6* α(K)exp=0.034 *10* (1979Sa18)

† Weighted average of values from 1973Ho27 and 1979Sa18, unless otherwise noted.

‡ From Adopted Gammas.

Weighted average of 1963Cr06 (electron measurements) and 1979Sa18.

@ From 1979Sa18.

& From adopted gammas branching ratios, Iγ(59.0γ+59.3γ)=2.0 *5*.

a From Iγ(59.0γ+59.3γ)=21 *2* in ^{189}Ir ε decay, Iγ(59.0γ+59.3γ)=2.2 *5* ^{189}Re β^- decay, and relative intensities deexciting the 95 and 276 levels.

b Deduced from coincidence data in 1979Sa18.

c From BrIcc v2.3b (16-Dec-2014) 2008Ki07, "Frozen Orbitals" appr.

d For absolute intensity per 100 decays, multiply by 0.055 *9*.

e Multiply placed with intensity suitably divided.

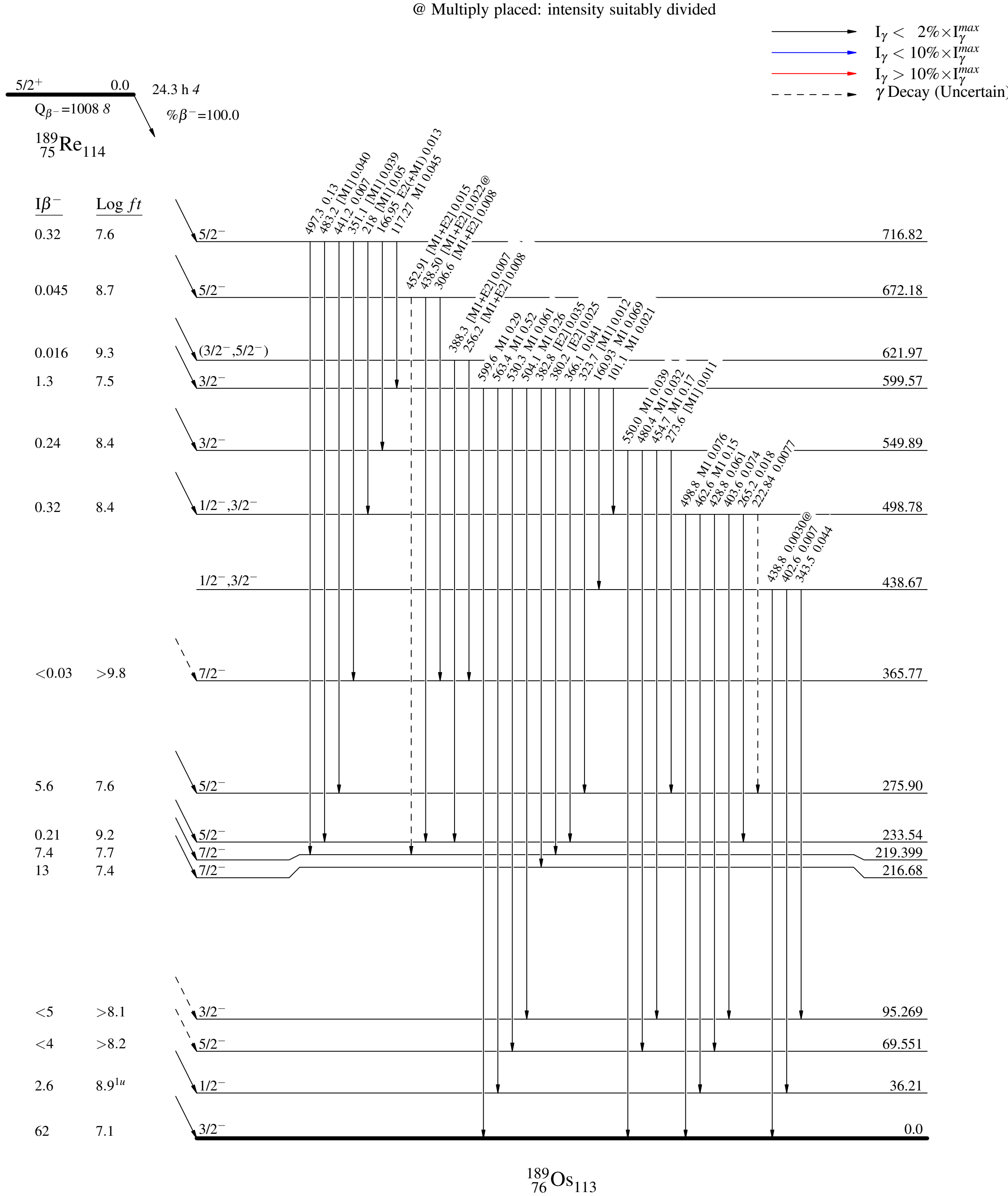
f Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

^{189}Re β^- decay (24.3 h) 1973Ho27,1979Sa18

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
@ Multiply placed: intensity suitably divided



^{189}Re β^- decay (24.3 h) 1973Ho27,1979Sa18

Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
@ Multiply placed: intensity suitably divided