^{185}Ta β^- decay 1970Ma60,1969Ku07

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 106, 619 (2005)	1-Nov-2005

Parent: ^{185}Ta: E=0.0; J^π=(7/2$^+$); $T_{1/2}$=49.4 min *15*; Q(β^-)=1994 *14*; %β^- decay=100.0

Additional information 1.

1970Ma60: Radioactivity ^{185}Ta produced by ^{186}W(γ,p); enriched target; Ge(Li) detectors; measured Eγ, Iγ, I(ce).

1969Ku07: Radioactivity of ^{185}Ta produced by W(γ,p); Ge(Li) and Si(Li) detectors; measured Eγ, Iγ, I(ce), Eβ, ICC, $\beta\gamma$-delay, Xγ-delay.

Others: 1955Po26, 1960Mo04.

^{185}W Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0	3/2$^-$	75.1 d *3*	$T_{1/2}$: from Adopted Levels.
23.6 *2*	1/2$^-$		
66.1 *1*	5/2$^-$		
93.30[@] *5*	3/2$^-$		
173.91 *5*	7/2$^-$	<1.5[#] ns	
188.3 *2*	5/2$^-$		
243.7 *1*	7/2$^-$	19.3[#] ns *5*	
391.0 *2*	(9/2$^-$)		
785.4 *4*	(9/2$^-$)		
1059 *2*	7/2$^-$		

[†] From a least-squares fit to γ-ray energies of 1970Ma60 and 1969Ku07, unless otherwise specified.
[‡] From Adopted Levels.
[#] From β-γ delayed coincidence (1969Ku07).
[@] From ^{185}W IT decay (1.67 min).

β^- radiations

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(935 *14*)	1059	0.56 *11*	7.5 *1*	av Eβ= 307 *5*
(1209 *14*)	785.4	1.7 *4*	7.5 *1*	av Eβ= 415 *6*
(1603 *14*)	391.0	1.9 *5*	7.9 *1*	av Eβ= 577 *6*
(1750 *14*)	243.7	68 *11*	6.5 *1*	av Eβ= 639 *6* E(decay): β spectrum measured by 1969Ku07 in coincidence with 173.9γ + 177.6γ. Other value: 1720, from a singles spectrum (1955Po26). Others: 1950Du54, 1951Mo47, 1960Mo04.
(1806 *14*)	188.3	0.55 *9*	8.6 *1*	av Eβ= 663 *6*
(1820 *14*)	173.91	27 *11*	6.9 *2*	av Eβ= 669 *6*

[†] Absolute intensity per 100 decays.

$\gamma(^{185}W)$

Iγ normalization: from decay scheme if ΣI(γ+ce) to g.s. and passing through the first three excited states equals 100%, thus neglecting possible β^- populations to these levels. The same value of the β^- endpoint energy observed from a singles β^- spectrum, and from a β^- spectrum in coincidence with 173.9γ + 177.6γ indicates negligible β^- population to these states (1969Ku07). This justifies the normalization procedure used. %Iγ(173.9γ + 177.6γ)=0.60 *25* (1960Mo04).

E_γ[†]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[f]	$I_{(\gamma+ce)}$[e]	Comments
23.6[b] *2*	0.50[b] *15*	23.6	1/2$^-$	0.0	3/2$^-$	(M1+E2)	0.10 *3*	93 *23*		α(L)= 71 *13*; α(M)= 17 *3* I$_\gamma$: Iγ=0.4 *2* from intensity balance at 23.6 level, and α(exp)=92 *20* deduced in ^{185}W IT decay (1.67 min). δ: from α=92 *20* deduced in ^{185}W IT decay (1.67 min).
42.5[b] *7*	0.20 *6*	66.1	5/2$^-$	23.6	1/2$^-$	E2		189		α(L)= 142; α(M)= 35.4 I$_\gamma$: from Iγ(66.1γ)=15 *3*, and Iγ(42.5γ)/Iγ(66.1γ)=0.013 *3* measured in ^{185}W IT decay (1.67 min). Mult.: from ^{185}W IT decay (1.67 min).
66.1 *3*	15 *3*	66.1	5/2$^-$	0.0	3/2$^-$	M1+E2	1.1 *3*	13 *3*		α(L)= 10.0 *17*; α(M)= 2.5 *4*; α(N+..)= 0.72 *15* δ: from α(L)exp=10.3 *16* (weighted average of 11.0 *28* and 10 *2*, from ^{185}W IT decay (1.67 min) (1969Ku07)). α(M)exp=3.5 *17* (1969Ku07).
69.7[gbd] *3*		93.30	3/2$^-$	23.6	1/2$^-$				1.21[a] *22*	
69.7[hdb] *3*	7.8[h] *10*	243.7	7/2$^-$	173.91	7/2$^-$	M1+E2	0.27 *6*	8.3 *50*		α(L)= 2.6 *3*; α(M)= 0.61 *7*; α(N+..)= 0.181 *24* α: Eγ=69.7 keV is very close to the K-binding energy (=69.525 keV). The value for α(K) used here covers the range from Eγ<69.5 keV (α(K)=0), to Eγ=70.0 keV (α(K)=10.4 for δ=0.27). δ: deduced from α(L)exp=2.9 *13*, α(M)exp=0.8 *3* (1969Ku07).
93.30[&] *5*	0.076 *25*	93.30	3/2$^-$	0.0	3/2$^-$	[M1,E2]		5.6 *4*	0.50[a] *16*	I$_\gamma$: from I(γ+ce) and α.
94.6[ci]	0.062 *12*	188.3	5/2$^-$	93.30	3/2$^-$	[M1,E2]		5.4 *4*		α(K)= 2.9 *19*; α(L)= 1.9 *10*; α(M)= 0.5 *3*; α(N+..)= 0.14 *8* I$_\gamma$: from Iγ(188γ)=0.48 *8*, and Iγ(94.6γ)/Iγ(188γ)=0.129 *10* measured in ^{185}W IT decay (1.67 min). Other value: <0.3 (1970Ma60).
107.80 *10*	10.7 *6*	173.91	7/2$^-$	66.1	5/2$^-$	M1+E2	1.2 *+6−3*	3.36 *10*		α(K)= 1.80 *25*; α(L)= 1.18 *12*; α(M)= 0.29 *3*; α(N+..)= 0.086 *9*

^{185}Ta β^- decay 1970Ma60,1969Ku07 (continued)

$\gamma(^{185}W)$ (continued)

E_γ[†]	I_γ[‡e]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	α[f]	Comments
									δ: deduced from α(L)exp=1.8 *6*, α(M)exp=1.0 *4* (1969Ku07).
122.05[&] *7*	0.060 *11*	188.3	5/2$^-$	66.1	5/2$^-$	[M1,E2]		2.3 *5*	α(K)= 1.4 *9*; α(L)= 0.6 *3*; α(M)= 0.16 *8*; α(N+..)= 0.047 *22* I_γ: from Iγ(188γ)=0.48 *8*, and Iγ(122γ)/Iγ(188γ)=0.125 *11* measured in ^{185}W IT decay (1.67 min).
147.3 *1*	4.6 *5*	391.0	(9/2$^-$)	243.7	7/2$^-$	(M1+E2)	0.8 *6*	1.34 *19*	α(K)= 1.0 *3*; α(L)= 0.29 *8*; α(M)= 0.068 *19*; α(N+..)= 0.020 *4* δ: derived from α(K)exp=0.95 *32* (1969Ku07).
150.3[ci] *2*	0.48[c] *12*	243.7	7/2$^-$	93.30	3/2$^-$	[E2]		0.844	α(K)= 0.361; α(L)= 0.365; α(M)= 0.0913; α(N+..)= 0.0268
164.9[c] *3*	0.48[c] *18*	188.3	5/2$^-$	23.6	1/2$^-$	[E2]		0.607	α(K)= 0.285; α(L)= 0.243; α(M)= 0.0607; α(N+..)= 0.0178
173.91 *5*	88 *6*	173.91	7/2$^-$	0.0	3/2$^-$	E2		0.504	α(K)= 0.248; α(L)= 0.194; α(M)= 0.0482; α(N+..)= 0.0141 Mult.: from α(K)exp=0.24 *7*, α(L)exp=0.16 *5*, and α(M)exp=0.05 *2* (1969Ku07).
177.59 *8*	100.0 *14*	243.7	7/2$^-$	66.1	5/2$^-$	M1(+E2)	0.3 *+4−3*	0.88 *8*	α(K)= 0.75 *10*; α(L)= 0.130 *24*; α(M)= 0.030 *6*; α(N+..)= 0.0090 *8* δ: deduced from α(K)exp=0.74 *14*, α(L)exp=0.10 *3*, α(M)exp=0.05 *2* (1969Ku07).
188.2 *2*	0.48 *8*	188.3	5/2$^-$	0.0	3/2$^-$	[M1,E2]		0.60 *22*	α(K)= 0.44 *24*; α(L)= 0.12 *5*; α(M)= 0.029 *13*; α(N+..)= 0.0087 *14*
243.7 *3*	14.6 *11*	243.7	7/2$^-$	0.0	3/2$^-$	[E2]		0.163	α(K)= 0.1002; α(L)= 0.0480; α(M)= 0.0118; α(N+..)= 0.00342
394.4 *5*	3.0 *10*	785.4	(9/2$^-$)	391.0	(9/2$^-$)	[M1]		0.109	α(K)= 0.0904; α(L)= 0.0141; α(M)= 0.00317; α(N+..)= 0.000938
541.7 *5*	3.0 *10*	785.4	(9/2$^-$)	243.7	7/2$^-$	[M1]		0.0475	α(K)= 0.0395; α(L)= 0.00606
[x]580.5 *10*	2.1 *7*								
[x]588.7 *10*	3.1 *10*								
[x]913 *3*	0.47 *14*								
965 *3*	0.35 *11*	1059	7/2$^-$	93.30	3/2$^-$	[E2]		0.00489	α(K)= 0.00398; α(L)= 0.000678
993 *3*	0.9 *3*	1059	7/2$^-$	66.1	5/2$^-$	[M1]		0.0102	α(K)= 0.00852; α(L)= 0.00128
1059 *3*	0.9 *3*	1059	7/2$^-$	0.0	3/2$^-$	[E2]		0.00406	α(K)= 0.00332; α(L)= 0.000550
[x]1122 *3*	0.008 *3*								
[x]1138 *3*	0.03 *1*								
[x]1147 *3*	0.03 *1*								

[†] Weighted average, with χ^2 minimization, from 1970Ma60 and 1969Ku07, unless otherwise specified. Values for Eγ>300 keV are from 1969Ku07.

[‡] From a statistical analysis of γ-ray intensities from 1970Ma60 and 1969Ku07, unless otherwise specified. The scales for the linearly related intensities from both studies have been adjusted using the methods of Tepel (1980TeZW) and Lederer (1982LeZJ). After a statistical analysis, data uncertainties have been increased

$^{185}_{74}W_{111}$-3

^{185}Ta β^- decay 1970Ma60,1969Ku07 (continued)

$\gamma(^{185}W)$ (continued)

when needed for minimizing χ^2. Calculations have been done using the computer program GAMUT (1984FiZU). Intensities for Eγ>300 keV are from 1969Ku07.

[#] From ce data of 1969Ku07. Transitions from ^{203}Tl, ^{170}Yb, ^{57}Fe, and ^{180}W were used for normalizing ce and photon intensities.

[@] Deduced from conversion coefficients (1969Ku07).

[&] γ ray not observed. Eγ is from ^{185}W IT decay (1.67 min).

[a] From intensity balance at 93.3 level, and I(γ+ce)(69.7γ)/I(γ+ce)(93.3γ)=2.8 *10* deduced from intensity balance at 93.3 level in ^{185}W IT decay (1.67 min).

[b] From 1969Ku07.

[c] From 1970Ma60.

[d] Multiply placed; however, Iγ component from 93.30 level (deduced from I(γ+ce)) is negligible.

[e] For absolute intensity per 100 decays, multiply by 0.257 *9*.

[f] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

[g] Multiply placed.

[h] Multiply placed with intensity suitably divided.

[i] Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

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^{185}Ta β^- decay 1970Ma60,1969Ku07

Decay Scheme

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