^{188}Ta β^- decay 2009Al30

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev, S. Juutinen, D. J. Hartley	NDS 150, 1 (2018)	1-Feb-2018

Parent: ^{188}Ta: E=0; J^π=(1$^-$); $T_{1/2}$=19.6 s *20*; Q(β^-)=5056 *55*; %β^- decay=100.0

Parent: ^{188}Ta: E=99 *33*; J^π=(7$^-$); $T_{1/2}$=19.6 s *20*; Q(β^-)=5056 *55*; %β^- decay≤100.0

2009Al30: Projectile fragmentation of ^{208}Pb beam at 1 GeV/nucleon with a ^{9}Be target at GSI facility. Fragment Recoil Separator (FRS) used to identify ^{188}Ta nuclide. The secondary ions were implanted into RISING active stopper consisting of double-sided silicon strip detectors. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma$(t), β(implanted ions) correlations, Iβ, and isomer half-lives using RISING array of 15 seven-element Ge cluster detectors for γ rays, two multi-wire proportional counters for position measurements, two scintillation detectors providing time-of-flight and position information, and two scintillators and an ionization chamber (MUSIC) for energy loss measurements.

The authors of 2009Al30 state that the presence of two, low-lying β-decaying states in ^{188}Ta cannot be ruled out. In fact, now that the 184-keV transition, which could not be placed in a level scheme by 2009Al30, was found to depopulate the K^π=8$^-$ isomer in ^{188}W (2010La16), provides clear evidence for the existence of a high-spin (J≈7) β- decaying state in ^{188}Ta. In addition, despite the large uncertainties in the measured gamma-ray intensities in 2009Al30, the total intensity for the 143-keV transition (depopulating the 2$^+$ state) is much larger than that of the 440-keV transition (depopulating the 4$^+$ state) which may be indicative that a low-spin β- decaying state in ^{188}Ta directly populates the 2$^+$ state in ^{188}W.

Since the level scheme proposed in 2009Al30 is incomplete, and the experimental data are of poor quality, no log *ft* values were calculated in the present evaluation. The 53 % β- decay branch to the 6$^+$ level of the g.s. band in ^{188}W reported in 2009Al30 and the deduced log *ft*=5.40 may be spurious, due to incomplete decay scheme, since such a transition would be forbidden with ΔK=7.

^{188}W Levels

E(level)[†]	J^π[‡]	Comments
0	0$^+$	
143.0 *10*	2$^+$	
440.0 *15*	4$^+$	
874.0 *18*	6$^+$	
1341.7 *5*	5$^{(-)}$	Additional information 1.
1742.7[#] *10*	7$^{(-)}$	
1926.7[@] *15*	8$^-$	

[†] From a least-squares fit to Eγ's.

[‡] From Adopted Levels.

[#] The existence of this level in β- decay of ^{188}Ta is based on the observed 401γ in 2009Al30, which is associated by the evaluators with the 7$^-$ to 5$^{(-)}$ transition, depopulating the 1742.7-keV level in the adopted level scheme of ^{188}W.

[@] The existence of this level in β- decay of ^{188}Ta is based on the observed 184γ in 2009Al30, which is associated by the evaluators with the 8$^-$ to 7$^-$ transition, depopulating the 1926.7-keV level in the adopted level scheme of ^{188}W.

γ(^{188}W)

E$_\gamma$[†]	I$_\gamma$[†]	E$_i$(level)	J_i^π	E$_f$	J_f^π	Mult.	α[@]	I$_{(\gamma+ce)}$[#]	Comments
143 *1*	100 *22*	143.0	2$^+$	0	0$^+$	[E2]	1.00 *3*	200 *44*	α(K)=0.405 *10*; α(L)=0.450 *16*; α(M)=0.113 *4* α(N)=0.0267 *10*; α(O)=0.00370 *13*; α(P)=3.05×10^{-5} *7*
184[‡] *1*		1926.7	8$^-$	1742.7	7$^{(-)}$				
[x]204 *1*									

Continued on next page (footnotes at end of table)

^{188}Ta β^- decay 2009Al30 (continued)

$\gamma(^{188}W)$ (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α [@]	$I_{(\gamma+ce)}$ [#]	Comments
297 *1*	123 *31*	440.0	4^+	143.0	2^+	[E2]	0.0876 *16*	134 *34*	α(K)=0.0585 *10*; α(L)=0.0222 *5*; α(M)=0.00542 *11* α(N)=0.001285 *25*; α(O)=0.000187 *4*; α(P)=5.01×10^{-6} *9*
401[‡] *1*		1742.7	$7^{(-)}$	1341.7	$5^{(-)}$				
434 *1*	80 *26*	874.0	6^+	440.0	4^+	[E2]	0.0301	82 *27*	α(K)=0.0224 *4*; α(L)=0.00592 *10*; α(M)=0.001415 *23* α(N)=0.000337 *6*; α(O)=5.06×10^{-5} *8*; α(P)=2.02×10^{-6} *3*

[†] From 2009Al30, unless otherwise stated.
[‡] Observed in 2009Al30, but the placement in the level scheme is based on 2010La16 and the Adopted Levels.
[#] From Iγ and α_T. Note, that if the ^{188}Ta β- decay proceeds via direct feeding to the 6^+ level at 874 keV, which then cascades via 434-, 297- and 143-keV gamma rays to the ^{188}W g.s., then one may expect Ti(434γ)=Ti(297γ)=Ti(143γ).
[@] 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.
[x] γ ray not placed in level scheme.

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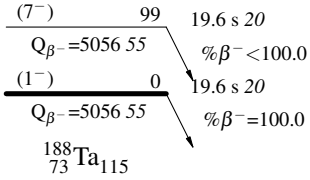
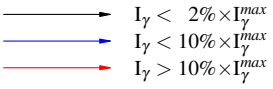
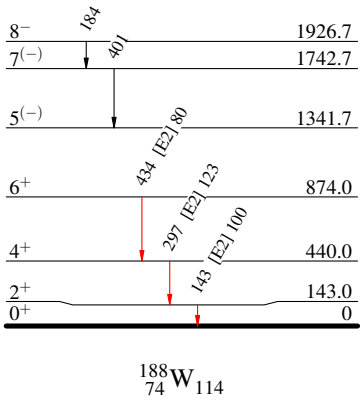
Decay Scheme

Intensities: Relative I_γ







$^{188}_{74}W_{114}$