^{190}W IT decay (111 ns)   2010La16,2011St21

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, [1] and Jun Chen[2]	NDS 169, 1 (2020)	15-Oct-2020

Parent: ^{190}W: E=1743.6 10; J^π=(8$^+$); $T_{1/2}$=111 ns 17; %IT decay=100.0

2010La16: ^{190}W ions were produced by E=840 MeV ^{136}Xe beam from the ATLAS accelerator at ANL, bombarding a 20 mg/cm^2 ^{192}Os target. Measured Eγ, Iγ, $\gamma\gamma$, delayed γ spectra using Gammasphere array at ATLAS-ANL facility. In reference 24, authors mentioned that full details of this study are to be published elsewhere. But in evaluators' search of literature, no further publication from this group seems to have appeared.

2011St21 (also 2012Al05, 2010FaZX, 2009Al30, 2009Fa06, 2009Al16, 2008StZY, 2005Ca02, 2003Po14, 2001Ca13, 2000Po26, 2000Sc32, 2000Wo13): ^{190}W nuclide formed by in-flight fragmentation of ^{208}Pb beam at 1 GeV/nucleon from the GSI UNILAC and SIS-18 accelerator complex. Target thickness of 2.526 g/cm^2, backed by ^{93}Nb foil of thickness 0.223 g/cm^2. Fragments separated and identified in flight by the Fragment Separator (FRS) operated in achromatic mode, based on time of flight, Bρ and energy loss. Transmitted ions slowed in Al degraders and stopped in a plastic catcher. The stopper was surrounded by the RISING γ-ray spectrometer. Measured Eγ, Iγ, delayed γ rays, isomer lifetime. ^{190}W beam was fully-stripped or mixture of H- or He-like nuclei.

Additional information 1.

The level scheme is essentially from 2010La16. 2011St21 provide energies of four gamma rays from the decay of 108$-\mu$s isomer.

^{190}W Levels

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$	Comments
0.0[#]	0$^+$		
206.8[#] 5	(2$^+$)		
565.1[#] 7	(4$^+$)		
1049.4[#] 9	(6$^+$)		
1642.2[#] 12	(8$^+$)		Transition intensity balance at this level is 25% 28, in contrast to expected zero balance. Note that the uncertainty is large for the 593.6γ. Or it is possible that the photon intensity of the 102γ is underestimated.
			E(level): level from 2010La16 only, and proposed as member of the g.s. band, as in 2005Ca02 and 2000Po26. This level and feeding γ of 102 keV are not reported by 2011St21.
1743.6 10	(8$^+$)	111 ns 17	%IT=100
			T$_{1/2}$: from γ(t) with gates on the prompt 324γ and 356γ feeding this level (2010La16).
			Configuration=ν9/2[505]$\otimes\nu$7/2[503] (2010La16,2009Fa06).

[†] From Eγ data, assuming 1 keV for 102γ.
[‡] From the Adopted Levels, essentially, based on data and interpretation from 2010La16.
[#] Band(A): g.s. band.

γ(^{190}W)

E$_\gamma$[†]	I$_\gamma$[#]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	α[@]	Comments
102	3.8 7	1743.6	(8$^+$)	1642.2	(8$^+$)	(M1)	4.49	α(K)=3.72 6; α(L)=0.593 9; α(M)=0.1350 19
								α(N)=0.0325 5; α(O)=0.00530 8; α(P)=0.000377 6
								α(exp)=4.3 13 (2010La16)
								E$_\gamma$: γ reported by 2010La16 only.
								I$_\gamma$: from ^{190}W IT decay (166 μs), based on data in 2010La16. Other: 3.4 9, deduced by evaluators from Iγ(102)/Iγ(694)=4.8 11/100 2 (2010La16) and Iγ(694)=71 10 in 2011St21.
								Mult.: M1, E2 from α(exp) deduced from γ-ray intensity balance (2010La16); M1 is assigned in 2010La16, as dominant M1 may

$\gamma(^{190}$W) (continued)

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[@]	$I_{(\gamma+ce)}$[#]	Comments
									be more likely for (8$^+$) to (8$^+$) transition.
									Reduced hindrance factor f_ν=5.4 *2*, ν=7, from B(M1)(W.u.)=7×10^{-6} *2*, as given in 2010La16.
206.8 *5*	78.4[‡] *3*	206.8	(2$^+$)	0.0	0$^+$	[E2]	0.275	100	α(K)=0.1540 *23*; α(L)=0.0921 *14*; α(M)=0.0229 *4* α(N)=0.00541 *9*; α(O)=0.000765 *12*; α(P)=1.228×10^{-5} *18* E$_\gamma$: others: 207.0 *3* (2005Ca02), 206 (2010La16), 207 (2000Po26). I$_\gamma$: others: 81 *10* (2011St21), 129 *33* (renormalized from 27 *7* in 2005Ca02), 105 *24* (renormalized from 65 *15* 2000Po26).
358.3 *5*	95.15[‡] *7*	565.1	(4$^+$)	206.8	(2$^+$)	[E2]	0.0510	100	α(K)=0.0362 *6*; α(L)=0.01134 *17*; α(M)=0.00274 *4* α(N)=0.000652 *10*; α(O)=9.63×10^{-5} *14*; α(P)=3.19×10^{-6} *5* E$_\gamma$: others: 357.4 *3* (2005Ca02), 358 (2010La16), 357 (2000Po26). I$_\gamma$: others: 92 *10* (2011St21), 114 *33* (renormalized from 24 *7* in 2005Ca02), 107 *24* (renormalized from 67 *15* 2000Po26).
484.3 *5*	97.77[‡] *3*	1049.4	(6$^+$)	565.1	(4$^+$)	[E2]	0.0228	100	α(K)=0.01729 *25*; α(L)=0.00419 *6*; α(M)=0.000996 *15* α(N)=0.000238 *4*; α(O)=3.61×10^{-5} *6*; α(P)=1.575×10^{-6} *23* E$_\gamma$: others: 484.0 *4* (2005Ca02), 484 (2010La16), 485 (2000Po26). I$_\gamma$: others: 100 *11* (2011St21), (100 *33* (renormalized from 21 *7* in 2005Ca02), 100 *32* (renormalized from 62 *20* 2000Po26).
593.6 *11*	20.6 *38*	1642.2	(8$^+$)	1049.4	(6$^+$)	[E2]	0.01387		α(K)=0.01088 *16*; α(L)=0.00230 *4*; α(M)=0.000541 *9* α(N)=0.0001293 *20*; α(O)=2.00×10^{-5} *3*; α(P)=1.003×10^{-6} *15* E$_\gamma$: from 2005Ca02. Others: Eγ=592 (2010La16), 591 (2000Po26). This γ was not seen by 2009Al30, and not reported by 2011St21, perhaps due to its weak population. I$_\gamma$: deduced by evaluators from intensity balance at 1642 level. Others: 43 *27* (2000Po26), renormalized from 27 *17*, 100 *38*, renormalized from 21 *8* in 2005Ca02. This γ is as strong as the 484.1γ with Iγ=21 *7* in Table 1 of 2005Ca02, but seen in the γ spectrum in Fig. 4 of 2005Ca02, much weaker than the 484.1γ peak.
694.0 *5*	78.5 *37*	1743.6	(8$^+$)	1049.4	(6$^+$)	[E2]	0.00972		α(K)=0.00776 *11*; α(L)=0.001509 *22*; α(M)=0.000351 *5*

Continued on next page (footnotes at end of table)

^{190}W IT decay (111 ns)   **2010La16,2011St21 (continued)**
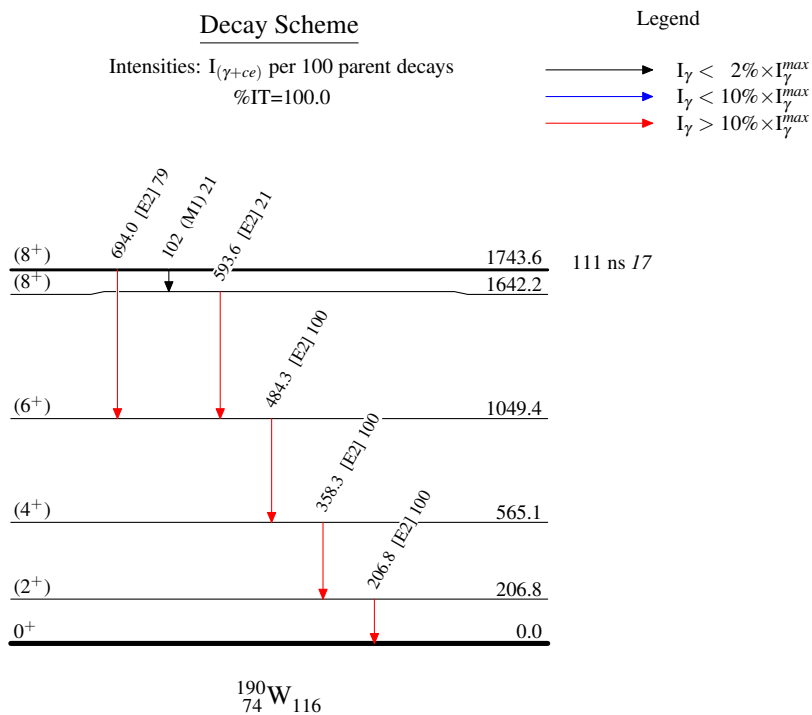
$\gamma(^{190}$W) (continued)

$E_\gamma^\dagger$	E_i(level)	Comments
		α(N)=8.41×10^{-5} *12*; α(O)=1.313×10^{-5} *19*; α(P)=7.19×10^{-7} *11*

E_γ: others: 694 (2010La16), 694.0 *7* (2005Ca02), 695 (2000Po26); in 2005Ca02 and 2000Po26, this γ was placed from a 2335, 10$^+$ level, as member of g.s. band). The decay scheme was modified by 2009Al30 and 2009Fa06 to place 694γ from this level, and omitting the 594γ from 1640 level as the 594γ was absent in the delayed γ spectrum obtained by 2009Al30.

I_γ: from ^{190}W IT decay (166 μs), based on data in 2010La16. Others: 71 *10* (2011St21), 76 *33* (renormalized from 16 *7* in 2005Ca02), 64 *24* (renormalized from 62 *20* 2000Po26).

Reduced hindrance factor f$_\nu$=3.7 *1*, ν=6, from B(E2)(W.u.)=3.9×10^{-4} *6*, as given in 2010La16.

† From 2011St21, unless otherwise stated. Uncertainty of 0.5 keV for Eγ values in 2011St21 are assigned in consultation with Zs. Podolyak (co-author of 2011St21) in January 2012.

‡ From I(γ+ce)=100 and α(theory) for E2.

$^\#$ Absolute intensity per 100 decays.

$^@$ 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.

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Decay Scheme

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

%IT=100.0

Legend

I$_\gamma$ < 2%×I$_\gamma^{max}$

I$_\gamma$ < 10%×I$_\gamma^{max}$

I$_\gamma$ > 10%×I$_\gamma^{max}$

$^{190}_{74}$W$_{116}$

^{190}W IT decay (111 ns)　　2010La16,2011St21

Band(A): g.s. band

(8^+)　　1642.2

594

(6^+)　　1049.4

484

(4^+)　　565.1

358

(2^+)　　206.8

207

0^+　　0.0

$^{190}_{74}\text{W}_{116}$