

¹⁹⁰W IT decay (166 μs) 2011St21,2010La16

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

Parent: ¹⁹⁰W: E=1840.6 14; J^π=(10⁻); T_{1/2}=166 μs 6; %IT decay=100.0

2011St21 (also **2012AI05**, **2010FaZX**, **2009AI30**, **2009AI16**, **2009Fa06**, **2008StZY**, **2005Ca02**, **2003Po14**, **2000Po26**): ¹⁹⁰W nuclide was formed by in-flight fragmentation of ²⁰⁸Pb beam at 1 GeV/nucleon from the GSI UNILAC and SIS-18 accelerator complex. Target thickness of 2.526 g/cm², backed by ⁹³Nb foil of thickness 0.223 g/cm². 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 E_γ, I_γ, delayed γ rays, isomer lifetime. ¹⁹⁰W beam was fully-stripped or mixture of H- or He-like nuclei.

Additional information 1.

2010La16: ¹⁹⁰W ions were produced by E=840 MeV ¹³⁶Xe beam from the ATLAS accelerator at ANL, bombarding a 20 mg/cm² ¹⁹²Os target. Measured E_γ, I_γ, γγ, 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.

The level scheme is from **2010La16**. **2011St21** provide energies of three gamma rays from the decay of levels up to 1049, (6⁺).

¹⁹⁰W Levels

E(level) [†]	J ^π [‡]	T _{1/2}	Comments
0.0	0 ⁺		
206.8 5	(2 ⁺)		
565.1 7	(4 ⁺)		
1049.4 9	(6 ⁺)		
1642.2 12	(8 ⁺)		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]⊗ν7/2[503] (2010La16,2009Fa06).
1840.6 14	(10 ⁻)	166 μs 6	%IT=100 T _{1/2} : from γ(t) (2010La16). Others: 108 μs 9 (2011St21 , from γ(t); earlier values: 106 μs 18 in 2009AI30 , 105 μs 22 in 2009Fa06 0.06 ms +150-3 in 2005Ca02 and ≤3.1 ms or 0.39 ms +∞-26 in 2000Po26) seems in disagreement. Interpreted by 2010La16 as yrast-trap isomer, not a K-isomer. Configuration=ν9/2[505]⊗ν11/2[615], K ^π =10 ⁻ (2010La16, 2005Ca02, 2000Po26).

[†] From E_γ data, assuming 1 keV uncertainty for E_γ when not stated.

[‡] From the Adopted Levels, essentially, based on data and interpretation from **2010La16**.

γ(¹⁹⁰W)

E _γ [†]	I _γ ^{‡#}	E _i (level)	J _i ^π	E _f	J _f ^π	Mult.	α [@]	Comments
97	2.04	1840.6	(10 ⁻)	1743.6	(8 ⁺)	M2	48.1	α(K)=33.3 5; α(L)=11.28 16; α(M)=2.80 4 α(N)=0.680 10; α(O)=0.1076 15; α(P)=0.00644 9 α(exp)=33 13 (2010La16) Mult.: from α(exp) deduced by 2010La16 from γ-ray intensity balance. Others: 46-keV, (E1), γ ray to 2335, (10 ⁺) level in 2000Po26 , with I _γ =60 30 relative to I _γ =62 21 for 484γ from (6 ⁺) state; 58.5 keV 5 with I _γ =60 13 relative to I _γ =21 7 for 484γ (2005Ca02). In later work 58.5-keV peak was assigned to x rays by 2009Fa06 .

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^{190}W IT decay (166 μs) [2011St21](#), [2010La16](#) (continued) $\gamma(^{190}\text{W})$ (continued)

E_γ †	I_γ ‡#	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	α @	$I_{(\gamma+ce)}$ #	Comments
102	3.8 7	1743.6	(8 ⁺)	1642.2	(8 ⁺)	(M1)	4.49		$\alpha(\text{K})=3.72$ 6; $\alpha(\text{L})=0.593$ 9; $\alpha(\text{M})=0.1350$ 19 $\alpha(\text{N})=0.0325$ 5; $\alpha(\text{O})=0.00530$ 8; $\alpha(\text{P})=0.000377$ 6 E_γ : γ reported by 2010La16 only. I_γ : deduced based on $I_\gamma(102)/I_\gamma(694)=4.8$ 11/100 2 (2010La16). Reduced hindrance factor $f_\nu=5.4$ 2, $\nu=7$, from $\text{B}(\text{M1})(\text{W.u.})=7\times 10^{-6}$ 2, as given in 2010La16 .
206.8 5	78.4 3	206.8	(2 ⁺)	0.0	0 ⁺	[E2]	0.275	100	$\alpha(\text{K})=0.1540$ 23; $\alpha(\text{L})=0.0921$ 14; $\alpha(\text{M})=0.0229$ 4 $\alpha(\text{N})=0.00541$ 9; $\alpha(\text{O})=0.000765$ 12; $\alpha(\text{P})=1.228\times 10^{-5}$ 18 E_γ : others: 207.0 3 (2005Ca02), 206 (2010La16), 207 (2000Po26).
358.3 5	95.15 7	565.1	(4 ⁺)	206.8	(2 ⁺)	[E2]	0.0510	100	$\alpha(\text{K})=0.0362$ 6; $\alpha(\text{L})=0.01134$ 17; $\alpha(\text{M})=0.00274$ 4 $\alpha(\text{N})=0.000652$ 10; $\alpha(\text{O})=9.63\times 10^{-5}$ 14; $\alpha(\text{P})=3.19\times 10^{-6}$ 5 E_γ : others: 357.4 3 (2005Ca02), 358 (2010La16), 357 (2000Po26).
484.3 5	97.77 3	1049.4	(6 ⁺)	565.1	(4 ⁺)	[E2]	0.0228	100	$\alpha(\text{K})=0.01729$ 25; $\alpha(\text{L})=0.00419$ 6; $\alpha(\text{M})=0.000996$ 15 $\alpha(\text{N})=0.000238$ 4; $\alpha(\text{O})=3.61\times 10^{-5}$ 6; $\alpha(\text{P})=1.575\times 10^{-6}$ 23 E_γ : others: 484.0 4 (2005Ca02), 484 (2010La16), 485 (2000Po26).
593.6 11	20.4 37	1642.2	(8 ⁺)	1049.4	(6 ⁺)	[E2]	0.01387		$\alpha(\text{K})=0.01088$ 16; $\alpha(\text{L})=0.00230$ 4; $\alpha(\text{M})=0.000541$ 9 $\alpha(\text{N})=0.0001293$ 20; $\alpha(\text{O})=2.00\times 10^{-5}$ 3; $\alpha(\text{P})=1.003\times 10^{-6}$ 15 E_γ : from 2005Ca02 . Others: $E_\gamma=592$ (2010La16), 591 (2000Po26). This γ was not seen by 2009A130 , and not reported by 2011St21 , perhaps due to its weak population.
694.0 5	78.5 37	1743.6	(8 ⁺)	1049.4	(6 ⁺)	[E2]	0.00972		$\alpha(\text{K})=0.00776$ 11; $\alpha(\text{L})=0.001509$ 22; $\alpha(\text{M})=0.000351$ 5 $\alpha(\text{N})=8.41\times 10^{-5}$ 12; $\alpha(\text{O})=1.313\times 10^{-5}$ 19; $\alpha(\text{P})=7.19\times 10^{-7}$ 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 2009A130 and 2009Fa06 to place 694 γ from this level, and omitting the 594 γ from 1640 level as the 594 γ was absent in the delayed γ spectrum obtained by 2009A130 . I_γ : deduced based on $I_\gamma(102)/I_\gamma(694)=4.8$ 11/100 2 (2010La16). Reduced hindrance factor $f_\nu=3.7$ 1, $\nu=6$, from $\text{B}(\text{E2})(\text{W.u.})=3.9\times 10^{-4}$ 6, as given in 2010La16 .

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${}^{190}\text{W}$ IT decay (166 μs) 2011St21,2010La16 (continued) $\gamma({}^{190}\text{W})$ (continued)

† From 2011St21, unless otherwise stated. Uncertainty of 0.5 keV for E_γ values in 2011St21 are assigned in consultation (in January 2012) with Zs. Podolyak (one of the authors of 2011St21).

‡ Deduced by evaluators from intensity balance at each level, with theoretical total conversion coefficients from BrIcc.

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 multiplicities, and mixing ratios, unless otherwise specified.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
%IT=100.0

Legend

-  $I_\gamma < 2\% \times I_\gamma^{max}$
 $I_\gamma < 10\% \times I_\gamma^{max}$
 $I_\gamma > 10\% \times I_\gamma^{max}$

