

^{189}W β^- decay (11.6 min) 1997Ya03,2009Yu11

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

Parent: ^{189}W : E=0; $T_{1/2}$ =11.6 min 2; $Q(\beta^-)$ =2360 40; % β^- decay=100.0

^{189}W - $Q(\beta^-)$: From 2017Wa10. Other: $Q(\beta^-)$ =2443 41 from measured mass excess(^{189}Re)=-38063 10 (2013Sh30) and mass excess(^{189}W)=-350620 40 (2017Wa10).

1997Ya03: 14.7 MeV neutrons irradiating 2-5 g of natural Os target for 20-30 minutes. Chemical separation of Re. Measured E_γ , I_γ . Determined ^{189}W half-life. HPGe detector.

1997Mi27: ^{188}W irradiated by the reactor neutrons. Measured E_γ , I_γ . Determined ^{189}W half-life. Ge(Li) detector.

2002Mi40: ^{189}W produced by $^{192}\text{Os}(n,\alpha)$ reaction. Target: 35 mg of Os metal, enriched to 99.9%. Measured E_γ , I_γ . Determined ^{189}W half-life. Ge detector.

2009Yu11: (n, α) reaction with 14-MeV neutrons from the Cockcroft-Walton accelerator at the Institute of Modern Physics, Chinese Academy of Sciences irradiated Os targets to produce ^{189}W , the decay of which was subsequently observed. The (x-ray) γ coin measurements were used to identify the 260.2 keV γ line in ^{189}Re and a lifetime measurement in agreement with previously measured half-lives of ^{189}W corroborated this identification. A clover detector consisting of four coaxial Ge crystals was used for $\gamma\gamma$ coincidences. Measured E_γ , half-life of ^{189}W decay, singles γ , (x ray) γ^- and $\gamma\gamma$ coincidences.

Other: 1965Ka07.

The decay scheme is based on the γ -ray data and the reaction data of 1997Ya03, 1977Hi06 and 1976Hi08. The γ placements are based on coincidence data from 2009Yu11. In view of $Q(\beta^-)$ =2360 keV and the highest populated level at 490 keV, and many unplaced γ rays, this decay scheme is considered as incomplete, thus no normalization is attempted.

 ^{189}Re Levels

E(level)	J^π^\dagger	$T_{1/2}$
0	5/2 ⁺	24.3 h 4
260.4 2	3/2 ⁺	
471.0 3		
490.1 3		

[†] From Adopted Levels.

 β^- radiations

E(decay)	E(level)	Comments
(2.36 $\times 10^3$ 4)	0	E(decay): measured $E\beta=2.5\times 10^3$ keV 2; not observed in coincidence with $E_\gamma>60$ keV, but branch is weak.

 $\gamma(^{189}\text{Re})$

E_γ^\dagger	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	α°	Comments
^x 126.2 1	9.5 4							E_γ : 130 keV 2 (1997Mi27,1965Ka07).
^x 143.8 [‡] 1	5.1 3							
^x 177.8 [‡] 1	18.4 6							E_γ : 178 keV 2 (1965Ka07).
^x 210.6 [‡] 2	8.6 4							
210.6 [#] 2	8.6 4	471.0		260.4	3/2 ⁺			E_γ : 222 keV 8 (1965Ka07).
^x 222.0 3	6.5 8							
229.7 [#] 2	11.4 6	490.1		260.4	3/2 ⁺			
260.4 2	100.0 10	260.4	3/2 ⁺	0	5/2 ⁺	[M1+E2]	0.24 11	E_γ : 260.2 keV 14 (2002Mi40,1997Mi27); 258 keV 3 (1965Ka07); 260.2 keV (2009Yu11).

Continued on next page (footnotes at end of table)

^{189}W β^- decay (11.6 min) 1997Ya03,2009Yu11 (continued) $\gamma(^{189}\text{Re})$ (continued)

E_γ [†]	I_γ [†]	$E_i(\text{level})$	Comments
^x 403.9 [‡] 5	6.7 3		
^x 421.4 5	100.8 20		E_γ : 421.5 keV 16 (2002Mi40,1997Mi27); 417 keV 4 (1965Ka07). I_γ : 103 (1997Mi27), 77 (2002Mi40).
^x 547.3 [‡] 6	27.7 11		E_γ : 545 keV 3 (2002Mi40,1997Mi27); 550 keV 10 (1965Ka07).
^x 668.6 [‡] 5	10.9 8		
^x 750.6 [‡] 3	6.7 4		
^x 786.3 [‡] 2	2.7 2		
^x 847.1 [‡] 2	4.0 3		E_γ : 855 keV 15 (1965Ka07), but could also be the 864.1 γ .
^x 864.1 [‡] 3	12.6 9		
^x 871.7 [‡] 4	3.2 5		
^x 957.5 [‡] 7	8.3 6		
^x 974.3 7	11.3 8		E_γ : 975 keV 3 (2002Mi40,1997Mi27). I_γ : 8 (1997Mi27).
^x 1001.4 [‡] 5	4.1 3		
^x 1185.3 [‡] 6	4.4 5		
^x 1418.8 [‡] 5	4.5 4		
^x 1466.2 [‡] 7	2.3 3		

[†] From 1997Ya03, unless otherwise specified.

[‡] From 1997Ya03, however, not observed in 1997Mi27 or 2002Mi40.

[#] From 1997Ya03 and confirmed by coincidence measurements in 2009Yu11, however, not observed in 1997Mi27 or 2002Mi40.

[@] 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.

^x γ ray not placed in level scheme.

^{189}W β^- decay (11.6 min) 1997Ya03,2009Yu11

Decay Scheme

Intensities: Relative I_γ

Legend

