

^{180}Au ε decay [1999Da18,1990De04](#)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 126, 151 (2015)	1-Feb-2015

Parent: ^{180}Au : $E=0.0$; $T_{1/2}=8.4$ s 6; $Q(\varepsilon)=8841$ 23; $\% \varepsilon + \% \beta^+$ decay ≤ 98.2

[1999Da18](#): ^{180}Au activity produced in $^{149}\text{Sm}(^{35}\text{Cl},4n)$, $E(^{35}\text{Cl})=170$ MeV. Measured $E\gamma$, $I\gamma$, $E(\text{ce})$, $I(\text{ce})$, $\gamma\gamma$, $\gamma\gamma(\theta)$, and $(\text{ce})-\gamma$ coincidences using the CAESAR array consisting of 6 Compton-Suppressed HPGe detectors and a superconducting electron spectrometer operated in Lens mode with a cooled Si(Li) detector.

[1998Br33](#): ^{180}Au activity produced in $^{149}\text{Sm}(^{35}\text{Cl},4n)$, $E(^{35}\text{Cl})=168$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma(\theta, H, t)$ using GASP array consisting of 40 Compton-suppressed HPGe detectors; deduced g-factor of first 2^+ state using implantation decay technique.

[1990De04](#): ^{180}Au activity produced by 200-MeV protons on targets of Pt-B alloy. Channel selection using magnet and electrostatic separation. Measured $E\gamma$, $I\gamma$, and $\gamma\gamma$ coincidences using four Ge detectors.

[1977Hu05](#): ^{180}Au activity produced by 600-MeV protons on Pb targets. Measured $E\gamma$, $I\gamma$, $\beta\gamma$ coin with Ge(Li) detectors and a scintillator.

The decay scheme is incomplete, as the g.s. feeding is not known and the highest observed level energy of ≈ 1.5 MeV is significantly smaller than the Q value of ≈ 8.8 MeV. Thus, the $I\gamma$ normalization and β feedings are not included in this evaluation.

α : [Additional information 1](#).

 ^{180}Pt Levels

E(level) [†]	$J\pi^{\ddagger}$	Comments
0.0 [#]	0^+	
153.26 [#] 7	2^+	$g=+0.32$ 6 g: from IPAC (1998Br33).
410.79 [#] 9	4^+	
478.17 [@] 15	0^+	
677.46 ^{&} 8	2^+	
757.1 [#] 5	6^+	
861.41 [@] 8	2^+	
962.72 ^{&} 10	$3^{(+)}$	
1049.29 ^{&} 13	(4^+)	
1177.6 3	0^+	
1187.23 18	2^+	
1248.13 [@] 19	(4^+)	
1351.20 16	2^+	
1387.5 3		
1491.3 3		
1535.02 20	$(2^+, 3, 4^+)$	

[†] From a least-squares fit to $E\gamma$'s by evaluator.

[‡] From the Adopted Levels.

[#] g.s. band.

[@] $K^\pi=0^+$ band.

[&] $K^\pi=2^+$ γ -band.

$\gamma(^{180}\text{Pt})$ $\alpha(\text{K})$, $\alpha(\text{L})$, $\alpha(\text{M})$, and A_{22}/A_0 , A_{44}/A_0 values are from **1999Da18**.

E_γ [†]	I_γ [†]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	α	Comments
153.3 <i>1</i>	100 <i>3</i>	153.26	2 ⁺	0.0	0 ⁺	E2	0.922	$\alpha(\text{K})=0.324$ <i>5</i> ; $\alpha(\text{L})=0.449$ <i>7</i> ; $\alpha(\text{M})=0.1156$ <i>17</i> ; $\alpha(\text{N})=0.0282$ <i>4</i> ; $\alpha(\text{O})=0.00444$ <i>7</i> $\alpha(\text{P})=3.08\times 10^{-5}$ <i>5</i> $E_\gamma=152.2$ <i>3</i> , $I_\gamma=100$ (1977Hu05).
184.3 [@] <i>5</i> 199.4 <i>4</i>	0.3 [@] <i>2</i> 0.5 <i>4</i>	861.41 677.46	2 ⁺ 2 ⁺	677.46 <i>2</i> ⁺ 478.17 <i>0</i> ⁺		[E2]	0.363 <i>6</i>	$\alpha(\text{K})=0.171$ <i>3</i> ; $\alpha(\text{L})=0.1444$ <i>24</i> ; $\alpha(\text{M})=0.0369$ <i>6</i> ; $\alpha(\text{N})=0.00901$ <i>15</i> ; $\alpha(\text{O})=0.001434$ <i>24</i> $\alpha(\text{P})=1.635\times 10^{-5}$ <i>25</i>
257.6 <i>1</i>	23.6 <i>9</i>	410.79	4 ⁺	153.26 <i>2</i> ⁺		E2 &	0.1569	$\alpha(\text{K})=0.0895$ <i>13</i> ; $\alpha(\text{L})=0.0508$ <i>8</i> ; $\alpha(\text{M})=0.01284$ <i>18</i> ; $\alpha(\text{N})=0.00314$ <i>5</i> ; $\alpha(\text{O})=0.000507$ <i>8</i> $\alpha(\text{P})=8.83\times 10^{-6}$ <i>13</i> $E_\gamma=256.4$ <i>3</i> , $I_\gamma=30$ <i>6</i> (1977Hu05). $\alpha(\text{K})_{\text{exp}}=0.116$ <i>24</i> . $A_{22}/A_0=0.10$ <i>4</i> , $A_{44}/A_0=-0.017$ <i>24</i> .
267.0 [@] <i>5</i>	0.3 [@] <i>2</i>	677.46	2 ⁺	410.79 <i>4</i> ⁺		[E2]	0.1403 <i>22</i>	$\alpha(\text{K})=0.0818$ <i>12</i> ; $\alpha(\text{L})=0.0442$ <i>7</i> ; $\alpha(\text{M})=0.01114$ <i>18</i> ; $\alpha(\text{N})=0.00273$ <i>5</i> ; $\alpha(\text{O})=0.000441$ <i>7</i> $\alpha(\text{P})=8.11\times 10^{-6}$ <i>12</i>
285.8 <i>4</i> 324.7 <i>2</i>	0.61 <i>12</i> 14.0 <i>6</i>	962.72 478.17	3 ⁽⁺⁾ 0 ⁺	677.46 <i>2</i> ⁺ 153.26 <i>2</i> ⁺		[E2]	0.0781	$\alpha(\text{K})=0.0502$ <i>7</i> ; $\alpha(\text{L})=0.0211$ <i>3</i> ; $\alpha(\text{M})=0.00526$ <i>8</i> ; $\alpha(\text{N})=0.001289$ <i>19</i> ; $\alpha(\text{O})=0.000211$ <i>3</i> $\alpha(\text{P})=5.11\times 10^{-6}$ <i>8</i> $E_\gamma=324.0$ <i>3</i> , $I_\gamma=18$ <i>3</i> , from a 1183 (2 ⁺) level (1977Hu05). $A_{22}/A_0=0.45$ <i>6</i> , $A_{44}/A_0=0.84$ <i>6</i> .
326.2 [@] <i>5</i> ^x 343.4 ^a <i>3</i> 346.3 [#]	≤ 0.3 [@] 14 <i>3</i> 0.6 [#] <i>2</i>	1187.23 757.1	2 ⁺ 6 ⁺	861.41 <i>2</i> ⁺ 410.79 <i>4</i> ⁺		E2	0.0650	$\alpha(\text{K})=0.0429$ <i>6</i> ; $\alpha(\text{L})=0.01671$ <i>24</i> ; $\alpha(\text{M})=0.00415$ <i>6</i> ; $\alpha(\text{N})=0.001018$ <i>15</i> ; $\alpha(\text{O})=0.0001675$ <i>24</i> $\alpha(\text{P})=4.40\times 10^{-6}$ <i>7</i>
372.0 <i>4</i>	0.45 <i>11</i>	1049.29	(4 ⁺)	677.46 <i>2</i> ⁺		[E2]	0.0532	$\alpha(\text{K})=0.0361$ <i>6</i> ; $\alpha(\text{L})=0.01299$ <i>19</i> ; $\alpha(\text{M})=0.00321$ <i>5</i> ; $\alpha(\text{N})=0.000788$ <i>12</i> ; $\alpha(\text{O})=0.0001303$ <i>19</i> $\alpha(\text{P})=3.73\times 10^{-6}$ <i>6</i>
382.9 <i>3</i>	2.7 <i>5</i>	861.41	2 ⁺	478.17 <i>0</i> ⁺		(E2) &	0.0492	$\alpha(\text{K})=0.0337$ <i>5</i> ; $\alpha(\text{L})=0.01175$ <i>17</i> ; $\alpha(\text{M})=0.00290$ <i>5</i> ; $\alpha(\text{N})=0.000712$ <i>11</i> ; $\alpha(\text{O})=0.0001180$ <i>17</i> $\alpha(\text{P})=3.49\times 10^{-6}$ <i>5</i> $\alpha(\text{K})_{\text{exp}}<0.11$.
386.6 <i>3</i>	1.0 [#] <i>5</i>	1248.13	(4 ⁺)	861.41 <i>2</i> ⁺		[E2]	0.0479	$\alpha(\text{K})=0.0330$ <i>5</i> ; $\alpha(\text{L})=0.01137$ <i>17</i> ; $\alpha(\text{M})=0.00281$ <i>4</i> ; $\alpha(\text{N})=0.000689$ <i>10</i> ;

^{180}Au ε decay **1999Da18,1990De04** (continued)

$\gamma(^{180}\text{Pt})$ (continued)									
E_γ [†]	I_γ [†]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	δ^b	α	Comments
									$\alpha(\text{O})=0.0001142$ 17 $\alpha(\text{P})=3.41\times 10^{-6}$ 5 I_γ : other: ≤ 0.3 (1990De04).
388.0 @ 5	0.5 @ 3	1351.20	2 ⁺	962.72	3 ⁽⁺⁾				
450.7 1	3.7 4	861.41	2 ⁺	410.79	4 ⁺	(E2) &		0.0321	$\alpha(\text{K})=0.0231$ 4; $\alpha(\text{L})=0.00684$ 10; $\alpha(\text{M})=0.001672$ 24; $\alpha(\text{N})=0.000411$ 6; $\alpha(\text{O})=6.89\times 10^{-5}$ 10 $\alpha(\text{P})=2.42\times 10^{-6}$ 4 $E_\gamma=450.5$ 5, $I_\gamma\approx 7$ (1977Hu05). $\alpha(\text{K})_{\text{exp}}<0.072$.
478 #		478.17	0 ⁺	0.0	0 ⁺	E0 &			$\alpha(\text{K})_{\text{exp}}>1.0$. $X(\text{E0/E2})=0.026$ 2.
490 #		1351.20	2 ⁺	861.41	2 ⁺	E0(+M1+E2) &		0.05 3	$\alpha(\text{K})=0.044$ 25; $\alpha(\text{L})=0.008$ 3; $\alpha(\text{M})=0.0019$ 7; $\alpha(\text{N})=0.00047$ 16; $\alpha(\text{O})=8.\text{E}-5$ 3; $\alpha(\text{P})=5.\text{E}-6$ 3 $\alpha(\text{K})_{\text{exp}}>0.30$. α : from $\alpha(\text{K})_{\text{exp}}$.
500.3 #	0.5 # 3	1177.6	0 ⁺	677.46	2 ⁺	[E2]		0.0247	$\alpha(\text{K})=0.0182$ 3; $\alpha(\text{L})=0.00493$ 7; $\alpha(\text{M})=0.001198$ 17; $\alpha(\text{N})=0.000294$ 5; $\alpha(\text{O})=4.97\times 10^{-5}$ 7 $\alpha(\text{P})=1.92\times 10^{-6}$ 3
524.3 1	28.6 6	677.46	2 ⁺	153.26	2 ⁺	E0+E2 &		0.072 6	$E_\gamma=524.2$ 3, $I_\gamma=44$ 7 (1977Hu05). $\alpha(\text{K})_{\text{exp}}=0.057$ 5, $\alpha(\text{L})_{\text{exp}}=0.010$ 2, $\alpha(\text{M})_{\text{exp}}=0.005$ 2. $A_{22}/A_0=-0.02$ 4, $A_{44}/A_0=0.24$ 5. δ : <-11 from $\gamma\gamma(\theta)$ (1999Da18). α : from sum of $\alpha(\text{K})_{\text{exp}}$, $\alpha(\text{L})_{\text{exp}}$, and $\alpha(\text{M})_{\text{exp}}$.
528.2 #	0.6 # 4	1491.3		962.72	3 ⁽⁺⁾				
551.9 1	2.4 3	962.72	3 ⁽⁺⁾	410.79	4 ⁺				$E_\gamma=552.4$ 4, $I_\gamma\approx 6.5$ (1977Hu05).
571.7 #	0.6 # 4	1535.02	(2 ⁺ ,3,4 ⁺)	962.72	3 ⁽⁺⁾				
571.9 #	≈ 0.3 #	1248.13	(4 ⁺)	677.46	2 ⁺	[E2]		0.0180	$\alpha(\text{K})=0.01363$ 19; $\alpha(\text{L})=0.00332$ 5; $\alpha(\text{M})=0.000799$ 12; $\alpha(\text{N})=0.000196$ 3; $\alpha(\text{O})=3.35\times 10^{-5}$ 5 $\alpha(\text{P})=1.441\times 10^{-6}$ 21
638.5 1	2.7 4	1049.29	(4 ⁺)	410.79	4 ⁺	(M1+E2)		0.028 14	$\alpha(\text{K})=0.022$ 12; $\alpha(\text{L})=0.0039$ 15; $\alpha(\text{M})=0.0009$ 4; $\alpha(\text{N})=0.00023$ 9; $\alpha(\text{O})=4.0\times 10^{-5}$ 16 $\alpha(\text{P})=2.5\times 10^{-6}$ 14 $\alpha(\text{K})_{\text{exp}}<0.06$. Mult.: E1, M1, E2 from $\alpha(\text{K})_{\text{exp}}$; $\Delta\pi$ =no from level scheme.
673.7 #	≈ 0.2 #	1351.20	2 ⁺	677.46	2 ⁺				
677.5 1	10.2 9	677.46	2 ⁺	0.0	0 ⁺	[E2]		0.01227	$\alpha(\text{K})=0.00956$ 14; $\alpha(\text{L})=0.00208$ 3; $\alpha(\text{M})=0.000495$ 7; $\alpha(\text{N})=0.0001218$ 17; $\alpha(\text{O})=2.10\times 10^{-5}$ 3 $\alpha(\text{P})=1.012\times 10^{-6}$ 15 $E_\gamma=676.5$ 4, $I_\gamma=20$ 4 (1977Hu05).
708.2 1	3.0 9	861.41	2 ⁺	153.26	2 ⁺	E0+M1+E2 &	2.0 +36-11	0.24 10	$\alpha(\text{K})=0.012$ 7; $\alpha(\text{L})=0.0023$ 9; $\alpha(\text{M})=0.00054$ 19;

¹⁸⁰Au ε decay **1999Da18,1990De04** (continued)

$\gamma(^{180}\text{Pt})$ (continued)									
E_γ †	I_γ †	E_i (level)	J_i^π	E_f	J_f^π	Mult. ‡	α	Comments	
								$\alpha(\text{N})=0.00013\ 5$; $\alpha(\text{O})=2.3\times 10^{-5}\ 9$ $\alpha(\text{P})=1.3\times 10^{-6}\ 7$ $E_\gamma=707.7\ 5$, $I_\gamma\approx 4$ (1977Hu05). $A_{22}/A_0=0.21\ 10$, $A_{44}/A_0=0.034\ 19$. $\alpha(\text{K})_{\text{exp}}=0.21\ 10$, $\alpha(\text{L})_{\text{exp}}=0.034\ 19$; unresolved from the 708.9 γ . α : from $\alpha(\text{K})_{\text{exp}}+\alpha(\text{L})_{\text{exp}}$.	
708.9#	0.3# 2	1187.23	2 ⁺	478.17	0 ⁺	[E2]	0.01112	$\alpha(\text{K})=0.00871\ 13$; $\alpha(\text{L})=0.00184\ 3$; $\alpha(\text{M})=0.000438\ 7$; $\alpha(\text{N})=0.0001078\ 15$; $\alpha(\text{O})=1.86\times 10^{-5}\ 3$ $\alpha(\text{P})=9.23\times 10^{-7}\ 13$	
710.4# 5	0.6# 4	1387.5		677.46	2 ⁺				
776.6 4	0.67 16	1187.23	2 ⁺	410.79	4 ⁺	[E2]	0.00916	$\alpha(\text{K})=0.00725\ 11$; $\alpha(\text{L})=0.001459\ 21$; $\alpha(\text{M})=0.000345\ 5$; $\alpha(\text{N})=8.50\times 10^{-5}\ 12$ $\alpha(\text{O})=1.478\times 10^{-5}\ 21$; $\alpha(\text{P})=7.67\times 10^{-7}\ 11$	
809.4 1	18.8 7	962.72	3 ⁽⁺⁾	153.26	2 ⁺	(E2)	0.00840	$\alpha(\text{K})=0.00668\ 10$; $\alpha(\text{L})=0.001316\ 19$; $\alpha(\text{M})=0.000311\ 5$; $\alpha(\text{N})=7.66\times 10^{-5}\ 11$ $\alpha(\text{O})=1.334\times 10^{-5}\ 19$; $\alpha(\text{P})=7.07\times 10^{-7}\ 10$ $E_\gamma=808.4\ 4$, $I_\gamma\approx 30\ 6$ (1977Hu05). $\alpha(\text{K})_{\text{exp}}<0.012$. $A_{22}/A_0=-0.19\ 6$, $A_{44}/A_0=-0.15\ 7$. Mult.: E1 or E2 from $\alpha(\text{K})_{\text{exp}}$. E2 favored from level scheme. δ : <-13 from $\gamma\gamma(\theta)$ (1999Da18).	
814.0#	1.4# 7	1491.3		677.46	2 ⁺				
837.4 4	0.4 3	1248.13	(4 ⁺)	410.79	4 ⁺				
858.1#	0.9# 5	1535.02	(2 ⁺ ,3,4 ⁺)	677.46	2 ⁺				
861.3 1	19.2 13	861.41	2 ⁺	0.0	0 ⁺	E2&	0.00739	$\alpha(\text{K})=0.00591\ 9$; $\alpha(\text{L})=0.001132\ 16$; $\alpha(\text{M})=0.000266\ 4$; $\alpha(\text{N})=6.56\times 10^{-5}\ 10$ $\alpha(\text{O})=1.147\times 10^{-5}\ 16$; $\alpha(\text{P})=6.25\times 10^{-7}\ 9$ $E_\gamma=859.7\ 6$, $I_\gamma=35\ 7$ (1977Hu05). $\alpha(\text{K})_{\text{exp}}=0.0054\ 12$.	
872.9 3	2.9 3	1351.20	2 ⁺	478.17	0 ⁺	E2	0.00719	$\alpha(\text{K})=0.00576\ 8$; $\alpha(\text{L})=0.001096\ 16$; $\alpha(\text{M})=0.000258\ 4$; $\alpha(\text{N})=6.35\times 10^{-5}\ 9$; $\alpha(\text{O})=1.111\times 10^{-5}\ 16$ $\alpha(\text{P})=6.09\times 10^{-7}\ 9$ $\alpha(\text{K})_{\text{exp}}<0.036$. Mult.: E1, M1, E2 from $\alpha(\text{K})_{\text{exp}}$; E2 from level scheme.	
895.8#	0.4# 2	1049.29	(4 ⁺)	153.26	2 ⁺	[E2]	0.00682	$\alpha(\text{K})=0.00548\ 8$; $\alpha(\text{L})=0.001031\ 15$; $\alpha(\text{M})=0.000242\ 4$; $\alpha(\text{N})=5.97\times 10^{-5}\ 9$; $\alpha(\text{O})=1.045\times 10^{-5}\ 15$ $\alpha(\text{P})=5.79\times 10^{-7}\ 9$	
940.6 3	2.3 9	1351.20	2 ⁺	410.79	4 ⁺	[E2]	0.00618	$\alpha(\text{K})=0.00498\ 7$; $\alpha(\text{L})=0.000919\ 13$; $\alpha(\text{M})=0.000215\ 3$; $\alpha(\text{N})=5.31\times 10^{-5}\ 8$; $\alpha(\text{O})=9.32\times 10^{-6}\ 13$ $\alpha(\text{P})=5.26\times 10^{-7}\ 8$	
1024.3#	4.0# 4	1177.6	0 ⁺	153.26	2 ⁺	(E2)	0.00522	$\alpha(\text{K})=0.00424\ 6$; $\alpha(\text{L})=0.000757\ 11$; $\alpha(\text{M})=0.0001767\ 25$; $\alpha(\text{N})=4.36\times 10^{-5}\ 6$ $\alpha(\text{O})=7.68\times 10^{-6}\ 11$; $\alpha(\text{P})=4.46\times 10^{-7}\ 7$ $\alpha(\text{K})_{\text{exp}}<0.009$.	

¹⁸⁰Au ε decay [1999Da18](#),[1990De04](#) (continued)

$\gamma(^{180}\text{Pt})$ (continued)

E_γ [†]	I_γ [†]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	δ ^b	α	Comments
1033.9 [@] 2	12.0 [@] 5	1187.23	2 ⁺	153.26	2 ⁺	E0+M1+E2	>5.7	0.00523 13	A ₂₂ /A ₀ =0.31 18, A ₄₄ /A ₀ =0.90 20. Mult.: E1 or E2 from $\alpha(\text{K})_{\text{exp}}$, E2 from level scheme. $\alpha(\text{K})=0.00425$ 11; $\alpha(\text{L})=0.000753$ 17; $\alpha(\text{M})=0.000176$ 4; $\alpha(\text{N})=4.33 \times 10^{-5}$ 10 $\alpha(\text{O})=7.65 \times 10^{-6}$ 17; $\alpha(\text{P})=4.48 \times 10^{-7}$ 12 $\alpha(\text{K})_{\text{exp}}=0.0087$ 19.
1094.5 3	1.12 23	1248.13	(4 ⁺)	153.26	2 ⁺	[E2]		0.00459	A ₂₂ /A ₀ =-0.09 9, A ₄₄ /A ₀ =0.20 11. E γ =1032.1 7, I γ =23 5 from a 1183 (2 ⁺) level (1977Hu05). $\alpha(\text{K})=0.00374$ 6; $\alpha(\text{L})=0.000653$ 10; $\alpha(\text{M})=0.0001521$ 22; $\alpha(\text{N})=3.75 \times 10^{-5}$ 6 $\alpha(\text{O})=6.62 \times 10^{-6}$ 10; $\alpha(\text{P})=3.93 \times 10^{-7}$ 6
1124.0 [#]	2.8 [#] 3	1535.02	(2 ⁺ ,3,4 ⁺)	410.79	4 ⁺				
1197.8 4	0.65 11	1351.20	2 ⁺	153.26	2 ⁺				
1234.1 [#] 3	1.3 [#] 4	1387.5		153.26	2 ⁺				
1351.4 [#]	≈ 2.0 [#]	1351.20	2 ⁺	0.0	0 ⁺	[E2]		0.00309	$\alpha(\text{K})=0.00252$ 4; $\alpha(\text{L})=0.000416$ 6; $\alpha(\text{M})=9.63 \times 10^{-5}$ 14; $\alpha(\text{N})=2.37 \times 10^{-5}$ 4; $\alpha(\text{O})=4.22 \times 10^{-6}$ 6 $\alpha(\text{P})=2.64 \times 10^{-7}$ 4
1382.0 [#]	2.1 [#] 4	1535.02	(2 ⁺ ,3,4 ⁺)	153.26	2 ⁺				

[†] From weighted average of data from [1999Da18](#) and [1990De04](#), except as noted. Uncertainties of 0.2 to 0.5 keV assumed for E γ 's from [1999Da18](#). Values from [1977Hu05](#) are included in the comments when available.

[‡] From the Adopted Gammas, except where noted.

[#] From [1999Da18](#).

[@] From [1990De04](#), not observed in [1999Da18](#).

[&] From $\alpha(\text{K})_{\text{exp}}$, $\alpha(\text{L})_{\text{exp}}$ ([1999Da18](#)).

^a Observed only in [1977Hu05](#).

^b From $\gamma\gamma(\theta)$ in [1999Da18](#).

^x γ ray not placed in level scheme.

