

¹⁷⁶Lu($\alpha, 2n\gamma$) 1979Du02

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	E. Achterberg, O. A. Capurro, G. V. Marti		NDS 110, 1473 (2009)	31-May-2008

Target: 50% enriched ¹⁷⁶Lu. Projectile: α 's, E=23-27 MeV. Measured E_γ , I_γ ; $\alpha\gamma(\theta)$ at $\theta=90^\circ$, 135° , and 162° ; $\gamma\gamma$ coin, $\gamma\gamma(t), \alpha\gamma(t)$. Detectors: Ge(Li), scin. Other: 1978Sc10.

¹⁷⁸Ta Levels

E(level) [†]	J ^{πa}	T _{1/2}	E(level) [†]	J ^{πa}	E(level) [†]	J ^{πa}	T _{1/2}
0.0+x [‡]	7 ⁻		459.4+x ^{&} 15	(7 ⁻)	886.2+x [@] 14	(11 ⁺)	
198.3+x [‡] 7	8 ⁻		567.4+x [#] 12	(10 ⁻)	994.0+x [#] 13	(12 ⁻)	
220.1+x [@] 10	(8 ⁺)	8.5 ns 10	645.3+x [@] 13	(10 ⁺)	1143.7+x [@] 15	(12 ⁺)	
289.5+x ^{&} 10	6 ⁻	2.0 ns 5	648.8+x ^{&} 18	(8 ⁻)	1243.0+x [#] 14	(13 ⁻)	
392.9+x [#] 8	(9 ⁻)	\approx 1 ns	657.9+x [‡] 13	(10 ⁻)	1417.2+x [@] 16	(13 ⁺)	
418.4+x [‡] 8	(9 ⁻)		768.2+x [#] 12	(11 ⁻)	1470.7+x 17	(15 ⁻)	60 ms 5
422.9+x [@] 13	(9 ⁺)		857.0+x ^{&} 20	(9 ⁻)			

[†] From least-squares adjustment to γ ray energies.

[‡] $K^\pi=7^-$ rotational band possible configuration= π 7/2[404] + ν 7/2[514].

[#] $K^\pi=9^-$ rotational band possible configuration= π 9/2[514] + ν 9/2[624].

[@] $K^\pi=(8)^+$ rotational band possible configuration= π 9/2[514] + ν 7/2[514].

[&] $K^\pi=6^-$ rotational band possible configuration= π 5/2[402] + ν 7/2[514].

^a From $\alpha\gamma(\theta)$, γ -ray multipolarities measured in (d,2n γ), and rotational band structure (1979Du02).

$\gamma(^{178}\text{Ta})$

E_γ [‡]	I_γ [†]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
^x 46.0	9.6					
^x 71.9	3.8					
^x 72.9 ^a						I_γ : Obscured by transitions from other nuclei.
^x 83.5	9.6					
^x 84.3	13					
^x 86.0	1.2					
^x 97.0	1.5					
^x 98.4	4.3					
^x 105.4	3.8					
^x 115.7 ^a						I_γ : Obscured by transitions from other nuclei.
^x 116.5	5.4					
^x 118.5	4.2					
^x 122.2	15					
^x 127.4	11					
^x 129.4	38					
^x 136.3	4.6					
^x 143.7	1.2					
^x 161.1	6.5					
169.9	5.4	459.4+x	(7 ⁻)	289.5+x	6 ⁻	
174.5	73	567.4+x	(10 ⁻)	392.9+x	(9 ⁻)	
^x 178.9	2.3					
189.4	5.8	648.8+x	(8 ⁻)	459.4+x	(7 ⁻)	
^x 190.9	6.2					
^x 193.4	3.1					

Continued on next page (footnotes at end of table)

¹⁷⁶Lu($\alpha, 2n\gamma$) **1979Du02 (continued)**

$\gamma(^{178}\text{Ta})$ (continued)

E_γ [‡]	I_γ [†]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	α [@]	Comments
194.5	70	392.9+x	(9 ⁻)	198.3+x	8 ⁻			
198.3	96	198.3+x	8 ⁻	0.0+x	7 ⁻			
200.9	60	768.2+x	(11 ⁻)	567.4+x	(10 ⁻)			
202.8	43	422.9+x	(9) ⁺	220.1+x	(8) ⁺			
^x 204.9	8.5							
208.2&	2.3&	857.0+x	(9 ⁻)	648.8+x	(8 ⁻)			E_γ : doublet.
^x 208.2&	6.5&							E_γ : doublet.
220.1&	100&	220.1+x	(8) ⁺	0.0+x	7 ⁻			B(E1)(W.u.)=2.3×10 ⁻⁶ 3 E_γ : doublet.
220.1&	3.8&	418.4+x	(9 ⁻)	198.3+x	8 ⁻			E_γ : doublet.
222.4	24	645.3+x	(10 ⁺)	422.9+x	(9) ⁺			
225.7	38	994.0+x	(12 ⁻)	768.2+x	(11 ⁻)			
227.7	48	1470.7+x	(15 ⁻)	1243.0+x	(13 ⁻)	(E2)	0.194	B(E2)(W.u.)=2.17×10 ⁻⁷ 19 Mult.: from transition intensity balance at the 1242.9 level, deduced from the delayed spectrum. E1 multipolarity is also possible.
^x 234.8	8.1							
^x 235.5	5.0							
239.5 ^a	≤1.2	657.9+x	(10 ⁻)	418.4+x	(9 ⁻)			
240.9	13	886.2+x	(11 ⁺)	645.3+x	(10 ⁺)			
249.0	40	1243.0+x	(13 ⁻)	994.0+x	(12 ⁻)			
257.5	9.6	1143.7+x	(12 ⁺)	886.2+x	(11 ⁺)			
^x 264.6	8.1							
^x 266.1	12							
273.4	5.4	1417.2+x	(13 ⁺)	1143.7+x	(12 ⁺)			
^x 283.8	11							
289.5	35	289.5+x	6 ⁻	0.0+x	7 ⁻			B(M1)(W.u.)=0.00037 10
^x 298.7	5.8							
^x 320.3	5.8							
^x 329.5	33							
^x 362.3	8.8							
375.4	12	768.2+x	(11 ⁻)	392.9+x	(9 ⁻)			
392.9	58	392.9+x	(9 ⁻)	0.0+x	7 ⁻			
^x 402.1	7.7							
418.3	12	418.4+x	(9 ⁻)	0.0+x	7 ⁻			
425.2	9.6 [#]	645.3+x	(10 ⁺)	220.1+x	(8) ⁺			
426.6	15 [#]	994.0+x	(12 ⁻)	567.4+x	(10 ⁻)			
459.6& ^a	12&	459.4+x	(7 ⁻)	0.0+x	7 ⁻			E_γ : doublet.
459.6&	7.7&	657.9+x	(10 ⁻)	198.3+x	8 ⁻			E_γ : doublet.
463.3	5.8	886.2+x	(11 ⁺)	422.9+x	(9) ⁺			
474.8	29	1243.0+x	(13 ⁻)	768.2+x	(11 ⁻)			
498.4	3.8	1143.7+x	(12 ⁺)	645.3+x	(10 ⁺)			
531	≤3.8	1417.2+x	(13 ⁺)	886.2+x	(11 ⁺)			

[†] Measured at $E\alpha=27$ MeV and $\theta=90^\circ$. Uncertainties range from 10 to 30% depending on I_γ . Values for $E\alpha=23$ MeV are also given.

[‡] Uncertainties are 0.1 to 0.3 keV depending on I_γ and on the complexity of the spectrum.

[#] 425.2 γ and 426.6 γ are not resolved. I_γ is from $\gamma\gamma$ coin.

[@] 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.

${}^{176}\text{Lu}(\alpha, 2n\gamma)$ 1979Du02 (continued)

$\gamma({}^{178}\text{Ta})$ (continued)

& Multiply placed with intensity suitably divided.

^a Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

$^{176}\text{Lu}(\alpha,2n\gamma)$ 1979Du02

Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

Legend

- ▶ $I_\gamma < 2\% \times I_\gamma^{max}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{max}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{max}$
- - - - -▶ γ Decay (Uncertain)

