

$^{175}\text{Lu}(\alpha,4n\gamma)$ 1972Fo20

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia		NDS 102, 719 (2004)	1-Jun-2004

$E(\alpha)=39\text{-}50$ MeV. Target: natural Lu. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ coin, $\gamma(\theta)$, $Ag(t)$, $T_{1/2}$.

Assignment of single particle configurations is based on the energy systematics of Nilsson orbitals in neighboring odd-A Lu, Hf and Ta nuclei.

 ^{175}Ta Levels

E(level) [†]	$J^{\pi\ddagger}$	$T_{1/2}$	Comments
0.0 [@]	7/2 ⁺	10.5 h 2	
36.5 ^{& 5}	(5/2 ⁺)		
51.4 ^{#a 10}	(5/2 ⁻)		
68.9 ^{?a}	(1/2 ⁻)		
124.3 ^{a 11}	(9/2 ⁻)		
129.75 ^{@ 16}	(9/2 ⁺)		
131.6 ^{b 2}	(9/2 ⁻)	>100 ns	
142.6 ^{& 5}	(7/2 ⁺)		
276.50 ^{b 22}	(11/2 ⁻)		
276.7 ^{& 5}	(9/2 ⁺)		
284.35 ^{@ 16}	(11/2 ⁺)		
296.8 ^{a 11}	(13/2 ⁻)		
436.2 ^{& 6}	(11/2 ⁺)		
446.8 ^{b 3}	(13/2 ⁻)		
461.41 ^{@ 19}	(13/2 ⁺)		
571.5 ^{a 11}	(17/2 ⁻)		
619.9 ^{& 6}	(13/2 ⁺)		
640.7 ^{b 3}	(15/2 ⁻)		
658.43 ^{@ 21}	(15/2 ⁺)		
826.3 ^{& 6}	(15/2 ⁺)		
857.4 ^{b 3}	(17/2 ⁻)		
872.7 ^{@ 3}	(17/2 ⁺)		
943.5 ^{a 11}	(21/2 ⁻)		
1052.1 ^{& 6}	(17/2 ⁺)		
1094.0 ^{b 3}	(19/2 ⁻)		
1102.1 ^{@ 3}	(19/2 ⁺)		
1297.6 ^{& 6}	(19/2 ⁺)		
1342.3 ^{@ 3}	(21/2 ⁺)		
1351.2 ^{b 3}	(21/2 ⁻)		
1405.6 ^{a 11}	(25/2 ⁻)		
1557.6 ^{?& 7}	(21/2 ⁺)		
1567.9 ^{c 3}	(21/2)	200 ns 70	$T_{1/2}$: from beam- $\gamma(t)$. Measured at $E(\alpha)=43$ MeV. Adopted value is an order of magnitude large – reasons unknown.
1593.1 ^{@ 3}	(23/2 ⁺)		
1621.5 ^{?b 4}	(23/2 ⁻)		
1910.6 ^{?b 7}	(25/2 ⁻)		
1950.2 ^{a 12}	(29/2 ⁻)		

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$^{175}\text{Lu}(\alpha,4n\gamma)$ **1972Fo20** (continued) ^{175}Ta Levels (continued)

<u>E(level)[†]</u>	<u>J^π[‡]</u>
2207.7 ^b 7	(27/2 ⁻)
2569.1 ^a 14	(33/2 ⁻)

[†] Deduced by evaluator from a least-squares fit to γ -ray energies.

[‡] J^π assignments are based on rotational structure and γ -ray decay patterns. Quantitative information from $\gamma(\theta)$ was deduced only for the 1/2[541] intra-band transitions.

From ^{175}W ε decay.

@ 7/2(404) band.

& 5/2(402) band.

^a 1/2(541) band.

^b 9/2(514) band.

^c 3-quasiparticle state?

 $\gamma(^{175}\text{Ta})$

<u>E_γ</u>	<u>I_γ[†]</u>	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>
36.5 ^c 5		36.5	(5/2 ⁺)	0.0	7/2 ⁺
^x 46.3 5					
51.38 [#]		51.4	(5/2 ⁻)	0.0	7/2 ⁺
^x 69.5 5					
72.9 4	12 2	124.3	(9/2 ⁻)	51.4	(5/2 ⁻)
^x 75.0 4	6.4 10				
^x 77.2 3	3.1 5				
^x 84.8 3	3.3 5				
^x 86.4 3	2.6 5				
^x 92.6 3	2.7 4				
^x 94.1 3	1.3 2				
^x 97.6 2	9.3 14				
^x 99.0 3	5 1				
^x 103.1 3	3.5 5				
^x 104.1 [‡] 3	7.0 9				
106.1 2	25 3	142.6	(7/2 ⁺)	36.5	(5/2 ⁺)
^x 109.5 3	4.0 6				
^x 110.7 3	5.0 8				
^x 117.8 3	2.3 3				
^x 121.7 3	2.2 3				
123.6 ^c 3	4.7 6	124.3	(9/2 ⁻)	0.0	7/2 ⁺
129.7 2	45 6	129.75	(9/2 ⁺)	0.0	7/2 ⁺
131.6 2	163 16	131.6	(9/2 ⁻)	0.0	7/2 ⁺
134.0 2	50 6	276.7	(9/2 ⁺)	142.6	(7/2 ⁺)
^x 143.1 2	9.6 14				
144.9 1	109 13	276.50	(11/2 ⁻)	131.6	(9/2 ⁻)
^x 147.9 3	9 2				
154.6 2	32 5	284.35	(11/2 ⁺)	129.75	(9/2 ⁺)
159.9 2	38 5	436.2	(11/2 ⁺)	276.7	(9/2 ⁺)
^x 161.1 2	18 3				
^x 163.7 2	26 4				
^x 165.7 3	8 1				
^x 166.7	6.3 10				
170.3 2	125 15	446.8	(13/2 ⁻)	276.50	(11/2 ⁻)

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$^{175}\text{Lu}(\alpha,4n\gamma)$ **1972Fo20** (continued) $\gamma(^{175}\text{Ta})$ (continued)

E_γ	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π
172.5 2	130 15	296.8	(13/2 ⁻)	124.3	(9/2 ⁻)
^x 175.5 3	14 2				
177.1 2	26 4	461.41	(13/2 ⁺)	284.35	(11/2 ⁺)
^x 179.0 [‡] 3	6.7 10				
183.7 2	41 5	619.9	(13/2 ⁺)	436.2	(11/2 ⁺)
^x 185.3 [‡] 3	9 1				
^x 190.0 3	3.3 5				
^x 191.3 2	15 2				
193.9 2	115 14	640.7	(15/2 ⁻)	446.8	(13/2 ⁻)
197.0 2	23 4	658.43	(15/2 ⁺)	461.41	(13/2 ⁺)
^x 201.7 [‡] 2	37 5				
^x 204.5 3	6.3 10				
206.4 3	92 11	826.3	(15/2 ⁺)	619.9	(13/2 ⁺)
^x 212.7 3	4.2 6				
214.4 3	8.6 12	872.7	(17/2 ⁺)	658.43	(15/2 ⁺)
216.8 ^b 2	84 ^{b&} 10	857.4	(17/2 ⁻)	640.7	(15/2 ⁻)
216.8 ^{bc} 2	84 ^{ba} 10	1567.9	(21/2)	1351.2	(21/2 ⁻)
^x 219.5 3	6 1				
225.9 2	33 4	1052.1	(17/2 ⁺)	826.3	(15/2 ⁺)
^x 228.5 3	9.0 15				
229.5 3	7.4 11	1102.1	(19/2 ⁺)	872.7	(17/2 ⁺)
^x 231.2 3	6.3 10				
^x 232.5 3	6 1				
^x 233.7 3	9.0 15				
236.6 2	58 7	1094.0	(19/2 ⁻)	857.4	(17/2 ⁻)
240.2 ^b 2	10.0 ^b 15	276.7	(9/2 ⁺)	36.5	(5/2 ⁺)
240.2 ^{bc} 2	10.0 ^b 15	1342.3	(21/2 ⁺)	1102.1	(19/2 ⁺)
^x 244.2 3	7 1				
245.7 2	21 3	1297.6	(19/2 ⁺)	1052.1	(17/2 ⁺)
251.0 3	9 1	1593.1	(23/2 ⁺)	1342.3	(21/2 ⁺)
^x 253.0 3	19 2				
257.2 2	23 3	1351.2	(21/2 ⁻)	1094.0	(19/2 ⁻)
^x 258.8 3	6 1				
260.0 ^c 3	6 1	1557.6?	(21/2 ⁺)	1297.6	(19/2 ⁺)
270.2 ^c 3	7.4 10	1621.5?	(23/2 ⁻)	1351.2	(21/2 ⁻)
^x 271.4 3	11.0 15				
274.7 1	140 17	571.5	(17/2 ⁻)	296.8	(13/2 ⁻)
^x 283.0 3	8 1				
284.4 2	25 3	284.35	(11/2 ⁺)	0.0	7/2 ⁺
^x 288.7 [‡] 3	9 1				
^x 290.6 3	6 1				
293.5 3	14 2	436.2	(11/2 ⁺)	142.6	(7/2 ⁺)
^x 296.3 3	8 1				
^x 305.1 3	8 1				
^x 310.1 3	15 2				
^x 311.5 3	27 4				
315.2 3	20 3	446.8	(13/2 ⁻)	131.6	(9/2 ⁻)
^x 318.4 3	6 1				
^x 325.4 3	12 2				
331.6 2	43 5	461.41	(13/2 ⁺)	129.75	(9/2 ⁺)
^x 335.3 3	8 1				
342.3 3	<39 [@]	619.9	(13/2 ⁺)	276.7	(9/2 ⁺)
^x 343.5 3	<39 [@]				
364.3 2	25 1	640.7	(15/2 ⁻)	276.50	(11/2 ⁻)

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$^{175}\text{Lu}(\alpha,4n\gamma)$ **1972Fo20 (continued)** $\gamma(^{175}\text{Ta})$ (continued)

E_γ	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π
372.0 1	97 12	943.5	(21/2 ⁻)	571.5	(17/2 ⁻)
374.1 2	44 5	658.43	(15/2 ⁺)	284.35	(11/2 ⁺)
^x 379.9 3	5 1				
^x 385.0 3	6 1				
^x 387.1 3	12 2				
390.1 3	19 2	826.3	(15/2 ⁺)	436.2	(11/2 ⁺)
^x 393.0 [‡] 3	11 2				
^x 401.0 5	9 2				
410.5 3	29 4	857.4	(17/2 ⁻)	446.8	(13/2 ⁻)
411.3 3	54 8	872.7	(17/2 ⁺)	461.41	(13/2 ⁺)
^x 416.8 3	20 3				
^x 422.5 4	8 1				
^x 424.9 4	8 1				
432.2 4	19 2	1052.1	(17/2 ⁺)	619.9	(13/2 ⁺)
^x 439.8 3	18 2				
443.6 2	32 4	1102.1	(19/2 ⁺)	658.43	(15/2 ⁺)
453.1 2	23 3	1094.0	(19/2 ⁻)	640.7	(15/2 ⁻)
462.1 1	72 9	1405.6	(25/2 ⁻)	943.5	(21/2 ⁻)
469.6 2	42 5	1342.3	(21/2 ⁺)	872.7	(17/2 ⁺)
471.2 2	30 4	1297.6	(19/2 ⁺)	826.3	(15/2 ⁺)
473.8 2	49 6	1567.9	(21/2)	1094.0	(19/2 ⁻)
^x 483.7 2	15 2				
490.9 3	34 4	1593.1	(23/2 ⁺)	1102.1	(19/2 ⁺)
^x 492.2 3	11 2				
494.0 3	17 2	1351.2	(21/2 ⁻)	857.4	(17/2 ⁻)
505.5 ^c 5	16 3	1557.6?	(21/2 ⁺)	1052.1	(17/2 ⁺)
527.7 ^c 5	33 4	1621.5?	(23/2 ⁻)	1094.0	(19/2 ⁻)
^x 535.3 5	25 3				
544.6 5	45 6	1950.2	(29/2 ⁻)	1405.6	(25/2 ⁻)
559.4 ^c 6	29 4	1910.6?	(25/2 ⁻)	1351.2	(21/2 ⁻)
^x 564.1 6	19 4				
586.2 ^c 6	20 3	2207.7?	(27/2 ⁻)	1621.5?	(23/2 ⁻)
^x 600.1 6	15 2				
618.9 6	50 7	2569.1	(33/2 ⁻)	1950.2	(29/2 ⁻)

[†] Measured at E=50 MeV.

[‡] Partly ^{175}Hf or ^{176}Hf .

[#] γ ray not observed, E_γ from ^{175}W ε decay.

[@] $I_\gamma(342.3\gamma + 343.5\gamma)=39.5$.

[&] From intensity balance $I_\gamma \geq 56$.

^a From intensity balance $I_\gamma \leq 43$. The 257.2 γ shows no 200-ns component, consistent with very small I_γ for 216.8 γ .

^b Multiply placed with undivided intensity.

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

^x γ ray not placed in level scheme.

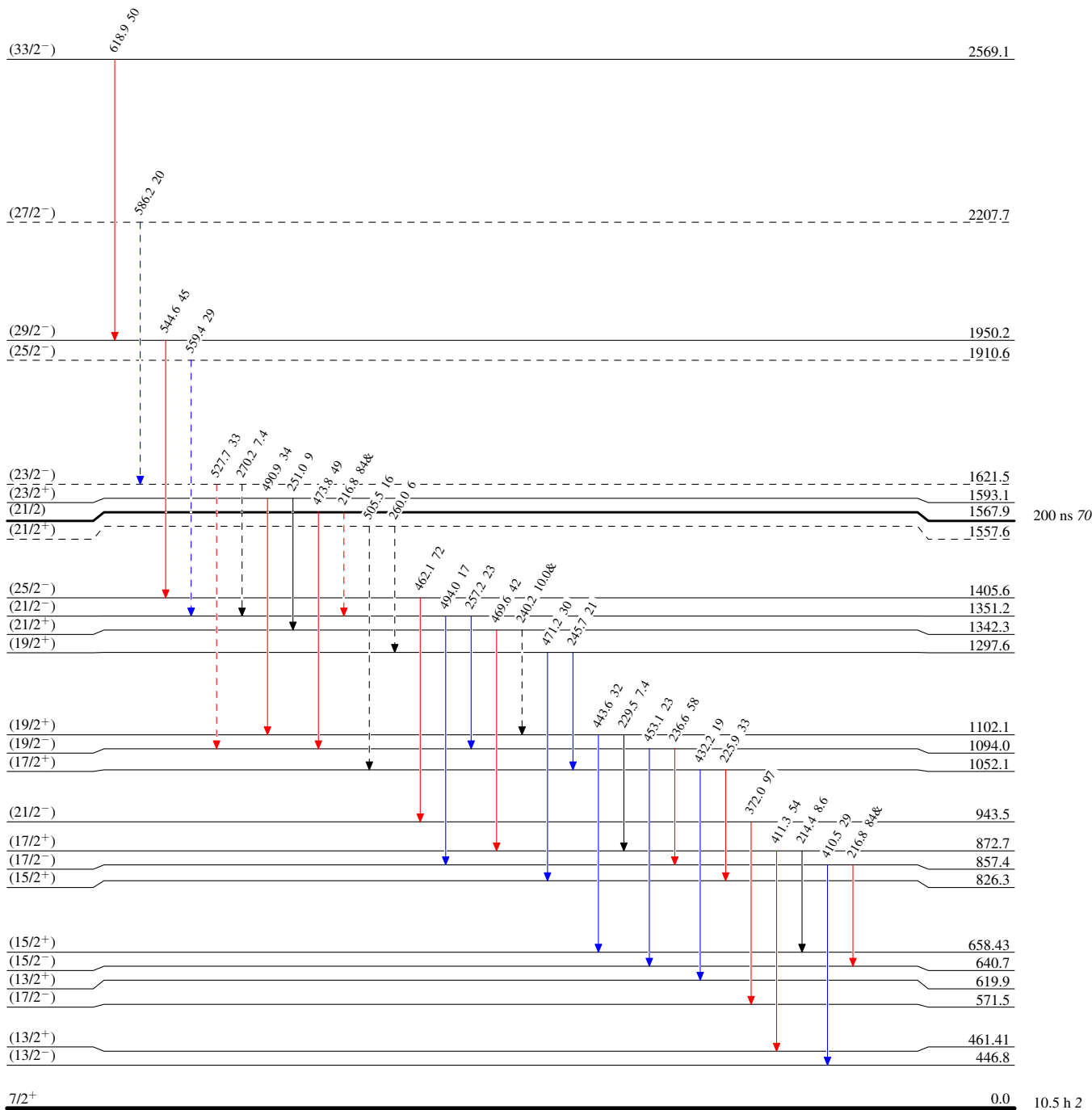
$^{175}\text{Lu}(\alpha,4n\gamma)$ 1972Fo20

Level Scheme

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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)



$^{175}_{73}\text{Ta}_{102}$

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Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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)

