

¹⁷⁵Lu(n,γ) E=2,24 keV res: av 1985Ho08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 107, 791 (2006)	15-Sep-2005

Target: ¹⁷⁵Lu (J^π=7/2⁺); detector: Ge(Li) pair spectrometer, FWHM=4.5 keV for 5000-keV γ rays.

¹⁷⁶Lu Levels

E(level) [†]	J ^π [‡]	Comments
235.4 2	3 ⁻ #	
299.8 3	3 ⁺ #	
305.8 3	2 ⁻ #	
371.9 5	4 ⁺ #	
380.5 5	2 ⁺ #	
433.7 6	2 ⁻ #	
437.4 8	5 ⁻ #	
450.1 3	3 ⁺ #	
463.6 3	4 ⁻ #	
487.4 3	5 ⁺ #	
505.0 2	3 ⁻ #	
533.6 2	4 ⁺ #	
595.3 5	4 ⁻ #	
634.6 7	3 ⁺ ,4 ⁺	
649.8 6	5 ⁺ #	
657.7 6		E(level): known doublet. States involved: one 3 ⁻ , one 5 ⁺ .
688.2 10		E(level): known doublet. States involved: one 2 ⁻ , one 3 ⁺ ,4 ⁺ .
714.8 6		E(level): known doublet. States involved: one 3 ⁺ ,4 ⁺ ; one 5 ⁻ .
722.6 4		E(level): possible doublet. States involved: one 4 ⁻ , one 2 ⁻ ,5 ⁻ . J ^π =(4) ⁻ in Adopted Levels.
733.9 2	3 ⁺ ,4 ⁺	
751.6 3	4 ⁻ #	
763.3 3	3 ⁻ #	
788.3 2		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ ; one 2 ⁻ ,5 ⁻ .
833.7 3		E(level): possible doublet. States involved: one 3 ⁻ ; one 2 ⁻ ,5 ⁻ . J ^π =3,4 in Adopted Levels.
843.1 3		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ ; one 2 ⁻ ,5 ⁻ .
860.5 4	4 ⁻ #	
868.8 3		E(level): known doublet. States involved: one 5 ⁻ ; one 3 ⁺ ,4 ⁺ .
883.3 2	3 ⁻ ,4 ⁻	
903.2 3		E(level): J ^π =3 ⁻ ,4 ⁻ , or possible doublet of two 2 ⁻ ,5 ⁻ states.
907.8 3		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ ; one 2 ⁻ ,5 ⁻ .
922.0 4	2 ⁻ ,5 ⁻	
928.5 10	5 ⁺ ,(2 ⁺)	
944.6 6	4 ⁻ #	
958.6 3		E(level): multiplet. States involved: at least three 3 ⁻ ,4 ⁻ ; or two 3 ⁻ ,4 ⁻ and two 2 ⁻ ,5 ⁻ .
973.7 6	5 ⁺ ,(2 ⁺)	J ^π : π=+ based on low reduced γ-ray intensity from 2-keV resonance.
987.9 4		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ and one 2 ⁻ ,5 ⁻ ; or two 2 ⁻ ,5 ⁻ .
1018.1 3	3 ⁺ ,4 ⁺	
1031.0 3	3 ⁻ ,4 ⁻	
1042.3 3		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ ; one 2 ⁻ ,5 ⁻ .
1054.3 2		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ ; one 2 ⁻ ,5 ⁻ .
1062.5 7	2 ⁻ ,5 ⁻	E(level): From S(n)=6287.98 15 and γ-ray of 2 keV resonance. J ^π : based on reduced γ-ray intensity from 2-keV resonance. Primary γ-ray from 24-keV resonance was obscured.
1068.3 3		E(level): possible doublet. States involved: one 3 ⁻ ,4 ⁻ ; one 2 ⁻ ,5 ⁻ .

Continued on next page (footnotes at end of table)

¹⁷⁵Lu(n,γ) E=2,24 keV res: av **1985Ho08** (continued)

¹⁷⁶Lu Levels (continued)

E(level) [†]	J ^π [‡]	Comments
1080.1 3	5 ⁻ ,(2 ⁻)	
1100.8 3		E(level): single state with J ^π =3 ⁻ ,4 ⁻ ; or a possible doublet with two 2 ⁻ ,5 ⁻ states.
6289.98 15		E(level): S(n)=6287.98 keV 15 + 2 keV.
6311.98 15		E(level): S(n)=6287.98 keV 15 + 24 keV.

[†] Weighted average of the level energies, deduced by the evaluator from S(n)=6287.98 15 and γ-rays of 2 keV and 24 keV neutron resonances, except otherwise noted.

[‡] Spins of levels populated by primary γ rays from 2-keV resonances are 2, 3, 4, or 5, based on the assumption that γ rays carry one unit of angular momentum, and that s-wave neutron capture is dominant, so that the spins and parities of capture resonance states are J^π=3⁺, 4⁺. Levels with spin J=3 and 4 are differentiated from those with spin J=2 and 5 through the intensity of primary transitions feeding these levels. This is because the former levels may be populated by dipole transitions from resonance states with either J=3 or 4, whereas dipole transitions from resonance states with only one spin value may populate levels with J=2 or 5. For s-wave neutron capture this leads to primary transitions to final levels with spins J=3 or 4 which are a factor of ≈2 more intense than those to final levels with spins J=2 or 5. See 1970Bo29 for a detailed description of this technique. For 24-keV resonances p-wave neutron capture into J^π=2⁻ to 5⁻ levels is significant. Since E1 primary transitions are on the average about 6 times more intense than M1 transitions, population of even-parity levels (J^π=1⁺ to 6⁺) from 24-keV resonances are stronger than from 2-keV resonances. Thus ratios between reduced γ-ray intensities (=I_γ/E_γ⁵) for the 24-keV and 2-keV resonances were used to determine level parities. The reduced γ-ray intensities from 2-keV resonances, which are distributed into four categories defined by the spins and parities (3⁻,4⁻), (2⁻,5⁻), (3⁺,4⁺), and (2⁺,5⁺), provide additional arguments for spin and parity assignments. The fact that all levels of a certain spin and parity within an energy range are populated with about the same reduced γ-ray intensity constitutes a powerful argument for spin and parity assignments of those levels not observed in this reaction.

[#] From Adopted Levels.

γ(¹⁷⁶Lu)

E _γ	I _γ /E _γ ⁵ [†]	E _i (level)	E _f	J _f ^π	E _γ	I _γ /E _γ ⁵ [†]	E _i (level)	E _f	J _f ^π
5189.2 [‡] 3	79 [‡] 3	6289.98	1100.8		5331.3 [‡] 5	275 [‡] 10	6289.98	958.6	
5209.9 [‡] 3	50 [‡] 3	6289.98	1080.1	5 ⁻ ,(2 ⁻)	5336.3 [#] 13	21 [#] 11	6311.98	973.7	5 ⁺ ,(2 ⁺)
5210.4 [#] 3	89 [#] 9	6311.98	1100.8		5344.9 [‡] 3	84 [‡] 3	6289.98	944.6	4 ⁻
5221.7 [‡] 3	104 [‡] 6	6289.98	1068.3		5353.4 [#] 3	184 [#] 9	6311.98	958.6	
5227.5 [‡] 7	38 [‡] 5	6289.98	1062.5	2 ⁻ ,5 ⁻	5360.3 [‡] 8	13 [‡] 3	6289.98	928.5	5 ⁺ ,(2 ⁺)
5233.6 [#] 4	66 [#] 9	6311.98	1080.1	5 ⁻ ,(2 ⁻)	5367.9 [‡] 3	39 [‡] 3	6289.98	922.0	2 ⁻ ,5 ⁻
5235.9 [‡] 3	114 [‡] 4	6289.98	1054.3		5368.1 [#] 4	52 [#] 9	6311.98	944.6	4 ⁻
5244.9 [#] 3	95 [#] 12	6311.98	1068.3		5382.2 [‡] 3	106 [‡] 10	6289.98	907.8	
5247.6 [‡] 3	71 [‡] 3	6289.98	1042.3		5384.4 [#] 7	53 [#] 10	6311.98	928.5	5 ⁺ ,(2 ⁺)
5257.5 [#] 3	96 [#] 10	6311.98	1054.3		5386.7 [‡] 3	91 [‡] 11	6289.98	903.2	
5258.8 [‡] 3	74 [‡] 3	6289.98	1031.0	3 ⁻ ,4 ⁻	5391.7 [#] 14	33 [#] 13	6311.98	922.0	2 ⁻ ,5 ⁻
5270.6 [#] 9	52 [#] 11	6311.98	1042.3		5403.7 [#] 9	86 [#] 17	6311.98	907.8	
5271.9 [‡] 3	27 [‡] 2	6289.98	1018.1	3 ⁺ ,4 ⁺	5406.7 [‡] 3	77 [‡] 3	6289.98	883.3	3 ⁻ ,4 ⁻
5281.5 [#] 6	50 [#] 10	6311.98	1031.0	3 ⁻ ,4 ⁻	5409.2 [#] 6	110 [#] 19	6311.98	903.2	
5294.0 [#] 5	52 [#] 8	6311.98	1018.1	3 ⁺ ,4 ⁺	5420.9 [‡] 3	101 [‡] 3	6289.98	868.8	
5301.7 [‡] 3	96 [‡] 3	6289.98	987.9		5428.7 [#] 3	70 [#] 7	6311.98	883.3	3 ⁻ ,4 ⁻
5316.5 [‡] 4	18 [‡] 2	6289.98	973.7	5 ⁺ ,(2 ⁺)	5429.2 [‡] 3	81 [‡] 3	6289.98	860.5	4 ⁻
5324.5 [#] 3	101 [#] 8	6311.98	987.9		5443.5 [#] 3	128 [#] 9	6311.98	868.8	

Continued on next page (footnotes at end of table)

$^{175}\text{Lu}(n,\gamma) E=2,24 \text{ keV res: av } \mathbf{1985\text{Ho08}} \text{ (continued)}$ $\gamma(^{176}\text{Lu}) \text{ (continued)}$

E_γ	$I_\gamma/E_\gamma^{5\ddagger}$	$E_i(\text{level})$	E_f	J_f^π	E_γ	$I_\gamma/E_\gamma^{5\ddagger}$	$E_i(\text{level})$	E_f	J_f^π
5446.9 ‡ 3	127 ‡ 3	6289.98	843.1		5694.2 ‡ 3	95 ‡ 2	6289.98	595.3	4 $^-$
5452.0 $^{\#}$ 4	86 $^{\#}$ 9	6311.98	860.5	4 $^-$	5717.2 $^{\#}$ 3	90 $^{\#}$ 6	6311.98	595.3	4 $^-$
5456.3 ‡ 3	97 ‡ 3	6289.98	833.7		5756.6 ‡ 3	17 ‡ 1	6289.98	533.6	4 $^+$
5469.0 $^{\#}$ 6	72 $^{\#}$ 10	6311.98	843.1		5778.2 $^{\#}$ 3	54 $^{\#}$ 5	6311.98	533.6	4 $^+$
5478.3 $^{\#}$ 6	69 $^{\#}$ 10	6311.98	833.7		5785.0 ‡ 3	71 ‡ 2	6289.98	505.0	3 $^-$
5501.6 ‡ 3	109 ‡ 3	6289.98	788.3		5802.6 ‡ 4	9 ‡ 1	6289.98	487.4	5 $^+$
5523.8 $^{\#}$ 3	128 $^{\#}$ 7	6311.98	788.3		5807.0 $^{\#}$ 3	69 $^{\#}$ 5	6311.98	505.0	3 $^-$
5526.4 ‡ 3	75 ‡ 2	6289.98	763.3	3 $^-$	5824.6 $^{\#}$ 4	31 $^{\#}$ 5	6311.98	487.4	5 $^+$
5538.1 ‡ 3	99 ‡ 3	6289.98	751.6	4 $^-$	5826.1 ‡ 3	84 ‡ 2	6289.98	463.6	4 $^-$
5548.9 $^{\#}$ 3	79 $^{\#}$ 6	6311.98	763.3	3 $^-$	5840.1 ‡ 3	21 ‡ 1	6289.98	450.1	3 $^+$
5556.2 ‡ 3	21 ‡ 2	6289.98	733.9	3 $^+,4^+$	5848.6 $^{\#}$ 3	78 $^{\#}$ 5	6311.98	463.6	4 $^-$
5560.6 $^{\#}$ 3	98 $^{\#}$ 6	6311.98	751.6	4 $^-$	5851.6 ‡ 4	52 ‡ 8	6289.98	437.4	5 $^-$
5567.0 ‡ 3	106 ‡ 3	6289.98	722.6		5856.1 ‡ 3	80 ‡ 8	6289.98	433.7	2 $^-$
5574.7 ‡ 3	62 ‡ 3	6289.98	714.8		5861.5 $^{\#}$ 4	43 $^{\#}$ 4	6311.98	450.1	3 $^+$
5578.0 $^{\#}$ 3	62 $^{\#}$ 5	6311.98	733.9	3 $^+,4^+$	5875.2 $^{\#}$ 3	65 $^{\#}$ 8	6311.98	437.4	5 $^-$
5589.7 $^{\#}$ 3	107 $^{\#}$ 7	6311.98	722.6		5880.5 $^{\#}$ 12	24 $^{\#}$ 8	6311.98	433.7	2 $^-$
5598.0 $^{\#}$ 4	54 $^{\#}$ 6	6311.98	714.8		5909.0 ‡ 5	9 ‡ 1	6289.98	380.5	2 $^+$
5602.0 ‡ 3	64 ‡ 2	6289.98	688.2		5917.7 ‡ 3	23 ‡ 1	6289.98	371.9	4 $^+$
^x 5619.4 $^{\#}$ 15	26 $^{\#}$ 10				5931.9 $^{\#}$ 5	35 $^{\#}$ 4	6311.98	380.5	2 $^+$
5626.1 $^{\#}$ 10	38 $^{\#}$ 10	6311.98	688.2		5940.7 $^{\#}$ 4	40 $^{\#}$ 4	6311.98	371.9	4 $^+$
5631.7 ‡ 3	123 ‡ 3	6289.98	657.7		5984.3 ‡ 3	47 ‡ 3	6289.98	305.8	2 $^-$
5640.0 ‡ 8	9 ‡ 2	6289.98	649.8	5 $^+$	5990.2 ‡ 3	27 ‡ 3	6289.98	299.8	3 $^+$
5654.7 ‡ 3	24 ‡ 1	6289.98	634.6	3 $^+,4^+$	6005.6 $^{\#}$ 6	44 $^{\#}$ 7	6311.98	305.8	2 $^-$
5654.9 $^{\#}$ 3	143 $^{\#}$ 7	6311.98	657.7		6012.3 $^{\#}$ 8	56 $^{\#}$ 8	6311.98	299.8	3 $^+$
5662.3 $^{\#}$ 8	27 $^{\#}$ 6	6311.98	649.8	5 $^+$	6054.4 ‡ 3	100 ‡	6289.98	235.4	3 $^-$
5678.1 $^{\#}$ 3	54 $^{\#}$ 5	6311.98	634.6	3 $^+,4^+$	6076.8 $^{\#}$ 3	95 $^{\#}$ 4	6311.98	235.4	3 $^-$

 ‡ Reduced average γ -ray intensity. ‡ From 2-keV neutrons. $^{\#}$ From 24-keV neutrons.^x γ ray not placed in level scheme.