

¹⁰²Pd(⁵⁸Ni,pαγ) 2016Ca42

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 160, 1 (2019)	21-Oct-2019

2016Ca42: E(⁵⁸Ni)=255 MeV on ¹⁰²Pd enriched target (≈ 1 mg/cm²). Found γ-decay structures through correlation with α decays by measuring reaction products, Eγ, Iγ, delayed γ, (recoils)(α)γγ-coin using RITU separator, JUROGAM array (43 Ge Compton-suppressed detectors) GREAT spectrometer at Jyvaskyla Accelerator Laboratory. Recoil-decay tagging (RDT) technique. Deduced levels, J, π, multipolarity, configurations, anti-aligned 1⁺ interaction between h_{11/2} protons and h_{9/2} neutrons. Comparison with shell-model calculations. Studied systematics of excited states in odd-A N=84 isotones of ¹⁴⁹Tb, ¹⁵¹Ho, ¹⁵³Tm, ¹⁵⁵Lu, ¹⁵⁷Ta.

¹⁵⁵Lu Levels

E(level) [†]	J ^π [‡]	T _{1/2}	Comments
0.0 [#]	(11/2 ⁻)	68 ^{&} ms 2	5561 5 keV α decay branch used by 2016Ca42 to select ¹⁵⁵ Lu γ decays. configuration: πh _{11/2} ⊗(νf _{7/2}) ₀ ² +.
20 6	1/2 ⁺	138 ^{&} ms 9	E(level),J ^π ,T _{1/2} : from Adopted Levels. 5596 5 keV α decay branch observed by 2016Ca42 but contaminated and impossible to use for ¹⁵⁵ Lu γ decay selection.
806.70 [#] 20	(15/2 ⁻)		configuration: πh _{11/2} ⊗(νf _{7/2}) ₂ ² +.
1491.5 [#] 3	(19/2 ⁻)		configuration: πh _{11/2} ⊗(νf _{7/2}) ₄ ² +.
1781 [@] 2	(25/2 ⁻)	2.69 ^{&} ms 3	Additional information 1. E(level): from the Adopted Values. 7390 5 keV α decay branch used by 2016Ca42 to select ¹⁵⁵ Lu γ decays. configuration: (πh _{11/2}) ³ ⊗νf _{7/2} h _{9/2} , with [πh _{11/2} ,νh _{9/2}] ₁ ⁺ .
1820.2 [#] 5	(23/2 ⁻)		configuration: πh _{11/2} ⊗(νf _{7/2}) ₆ ² +.
2299.5 [@] 5	(27/2 ⁻)		Proposed as the fully aligned configuration. configuration: πh _{11/2} ⊗νf _{7/2} h _{9/2} .
2959.2 [@] 6	(29/2 ⁺)		configuration: πh _{11/2} ⊗νf _{7/2} i _{13/2} .
3065.5 [@] 6	(31/2 ⁺)		configuration: πh _{11/2} ⊗νf _{7/2} i _{13/2} .
3419.6 6			
3446.7 7			
3775.0 6			
3862.9 6	(35/2 ⁺)		
4074.9 6	(37/2 ⁻)		
4634.6 7			
4939.1 7			
5032.8 7			
5129.1 8			
5286.9 8			
5373.9 7			
5483.8 8			
5668.4 8			
6034.0 8			
6060.9 ^a 8			
6266.3 8			
6441 ^a			
7100 ^a			

[†] From least-squares fit to Eγ's for levels above (25/2⁻), 1781.

[‡] From 2016Ca42 based on systematics of odd-A N=84 isotones of ¹⁵⁵Lu and shell model calculations.

[#] Band(A): Band based on (11/2⁻) g.s.. Based on πh_{11/2}⊗(νf_{7/2})² (2016Ca42). ΔEγ's not given in 2016Ca42 were adopted by

$^{102}\text{Pd}(^{58}\text{Ni},\text{p}\alpha\gamma)$ **2016Ca42 (continued)** ^{155}Lu Levels (continued)

evaluator in analogy with those given by authors for γ 's in Table 1 "Energy and efficiency-corrected relative intensities".

@ Seq.(B): Cascade based on the $(25/2^-)$ isomer.

& Adopted value.

^a Level marked as uncertain in Fig. 2 "Level Scheme" of **2016Ca42** presumably because the order of the γ rays in cascade is not certain.

 $\gamma(^{155}\text{Lu})$

Unplaced γ rays originate in the level scheme part that decays to $(25/2^-)$ isomer.

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	Comments
106.3 1	165 3	3065.5	$(31/2^+)$	2959.2	$(29/2^+)$	(M1)	Mult.: assumed by 2016Ca42 : D, due to higher lifetimes expected from higher mult's, (M1) from better compatibility with intensities of other transitions.
212.1 2	498 3	4074.9	$(37/2^-)$	3862.9	$(35/2^+)$	[E1]	Mult.: 2016Ca42 adopted (E1) with no explicit arguments.
^x 246.0 2	45 1						
^x 268.4 2	22 1						
299.8 2	108 2	4074.9	$(37/2^-)$	3775.0			
^x 322.8 2	38 2						
328.7 3	320 20	1820.2	$(23/2^-)$	1491.5	$(19/2^-)$		
341.1 2	172 2	5373.9		5032.8			
354.2 2	355 3	3419.6		3065.5	$(31/2^+)$		
377 [†]		6441?		6060.9?			No γ ray is listed in Table 1 (2016Ca42) for this level.
381.5 2	64 2	5668.4		5286.9			
397.9 2	245 3	5032.8		4634.6			
416.2 2	37 2	3862.9	$(35/2^+)$	3446.7			
443.3 2	100 2	3862.9	$(35/2^+)$	3419.6			
^x 513.0 2	50 2						
518.5 2	1000	2299.5	$(27/2^-)$	1781	$(25/2^-)$	[M1]	Mult.: 2016Ca42 adopted (M1) with no explicit arguments.
544.7 2	119 2	5483.8		4939.1			
550.2 2	231 3	6034.0		5483.8			
559.5 2	353 4	4634.6		4074.9	$(37/2^-)$		
659 [†]		7100?		6441?			No γ ray is listed in Table 1 (2016Ca42) for this level.
659.7 2	1004 5	2959.2	$(29/2^+)$	2299.5	$(27/2^-)$	[E1]	Mult.: 2016Ca42 adopted (E1) with no explicit arguments.
^x 681.9 2	20 2						
684.8 2	820 80	1491.5	$(19/2^-)$	806.70	$(15/2^-)$		
687.0 3	84 2	6060.9?		5373.9			
^x 696.0 3	36 2						
709.2 3	116 3	3775.0		3065.5	$(31/2^+)$		
797.5 3	403 4	3862.9	$(35/2^+)$	3065.5	$(31/2^+)$	[E2]	Mult.: 2016Ca42 adopted (E2) with no explicit arguments.
806.7 2	1000	806.70	$(15/2^-)$	0.0	$(11/2^-)$		
958.5 3	66 3	5032.8		4074.9	$(37/2^-)$		
^x 997.5 4	28 2						
1054.2 4	50 3	5129.1		4074.9	$(37/2^-)$		
1076.2 4	148 4	4939.1		3862.9	$(35/2^+)$		
^x 1122.4 5	24 5						
^x 1144.1 4	33 2						
^x 1186.1 6	21 3						
1212.0 4	64 3	5286.9		4074.9	$(37/2^-)$		

Continued on next page (footnotes at end of table)

 $^{102}\text{Pd}(^{58}\text{Ni},\text{p}\alpha\gamma)$ **2016Ca42** (continued) $\gamma(^{155}\text{Lu})$ (continued)

<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>	<u>E_f</u>
1233.5 4	91 3	6266.3	5032.8
^x 1314.5 4	110 3		

[†] Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

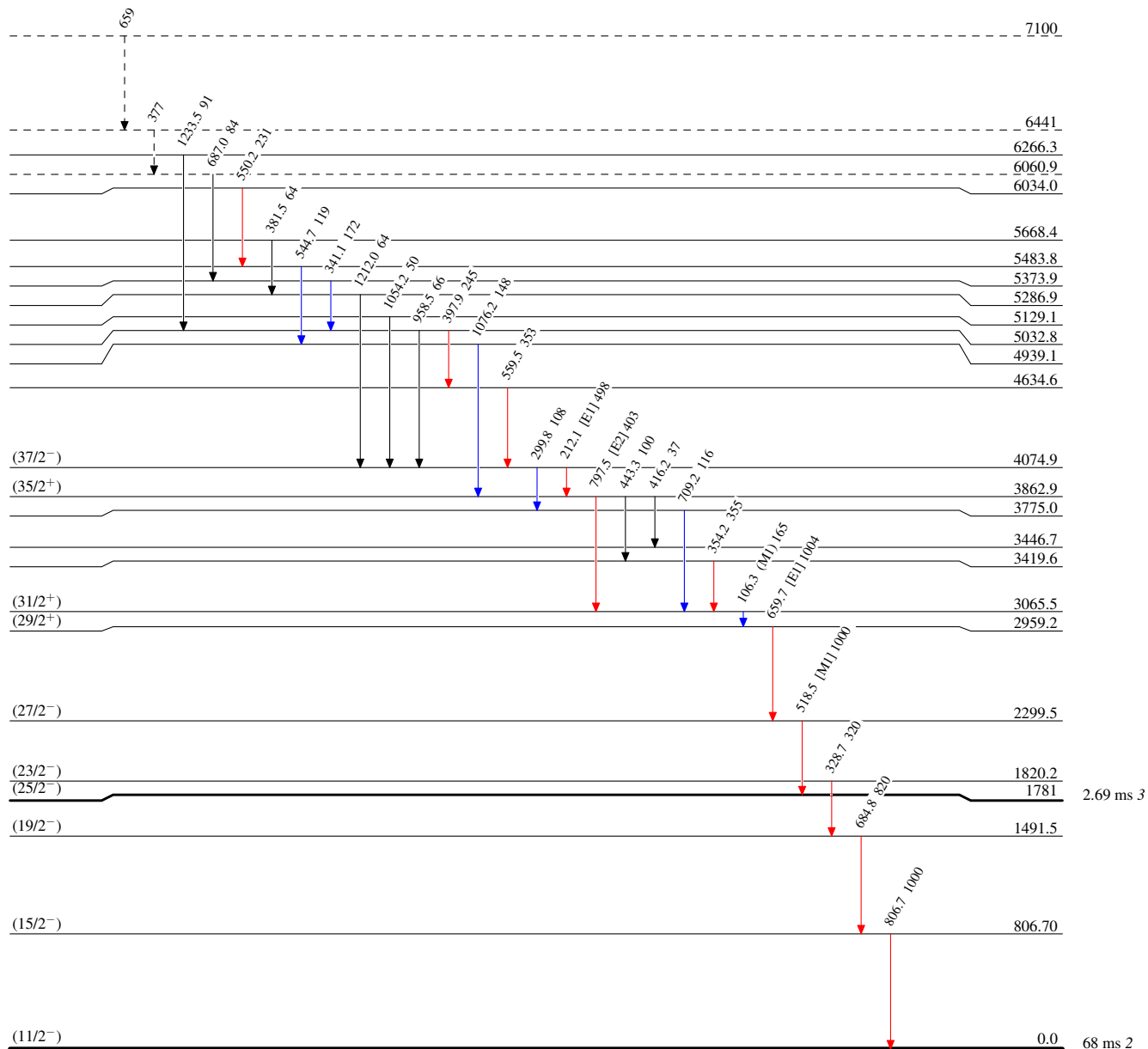
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Legend

Level Scheme

Intensities: Type not specified

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



$^{102}\text{Pd}(^{58}\text{Ni},\text{p}\alpha\gamma)$ **2016Ca42**