Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Janos Timar and Zoltan Elekes, Balraj Singh	NDS 121, 143 (2014)	31-May-2014

Q(β^-)=7769 *19*; S(n)=676×10[1] *15*; S(p)=12885 *8*; Q(α)=−1103×10[1] *60* 2012Wa38
S(2n)=12082 *21*, S(2p)=28830 *200* (syst), Q(β^-n)=2453 *18* (2012Wa38).

1970OsZZ, 1974Gr29, 1975Al11, 1978Al18: ^{129}In produced in thermal neutron fission of ^{235}U followed by mass separation at OSIRIS Studsvik facility, measured half-life, β, β strength functions.

Later decay studies: 1980Lu04, 1986Go10.

2009Ar04: experiment performed at ISOLDE facility. 1 GeV proton beam hit Ta or W rod producing neutrons close to uranium target where fission is induced. The products were laser ionized after diffusion out the heated target. γ-ray single and coincidence spectra measured with laser on and off by four HPGe detectors. β rays measured by ΔE-E β telescope.

2012Ha25: mass measurement using Penning-trap system at JYFL; mass excess=−72838.0 keV *26*.

2013Ka08: mass excess=−72379 keV *4* for (1/2$^-$) isomer in ^{129}In measured relative to that of g.s. of ^{130}Xe using Penning-trap system at JYFL facility.

The level scheme is primarily from ^{129}Cd β^- decay, and is considered as tentative.

^{129}In Levels

Cross Reference (XREF) Flags

- A ^{129}Cd β^- decay:mixed
- B ^{129}In IT decay (8.7 μs)
- C ^{129}In IT decay (110 ms)
- D ^{130}Cd β^-n decay (162 ms)

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF	Comments
0.0	(9/2$^+$)	611 ms *5*	ABCD	%β^-=100; %β^-n=0.23 *7* (1993Ru01) %β^-n: value recommended in 1993Ru01 and 2002Pf04 based on the following measurements: 0.25 *5* (1980Lu04), 0.13 *3* (1986ReZU), 0.331 *32* (1993Ru01). $T_{1/2}$: weighted average of 611 ms *5* (1993Ru01) and 610 ms *10*. (1986Wa17,1986ReZU). Others: 590 ms *20* (1980Lu04), 0.8 s *3* (1970OsZZ, 1974Gr29,1975Al11) for either or both 0.61-s and 1.23-s activities. Configuration=$\nu h^{-2}_{11/2}\otimes\pi g^{-1}_{9/2}$.
459 *5*	(1/2$^-$)	1.23 s *3*	AB	%β^->99.7; %IT<0.3; %β^-n=3.6 *4* (1993Ru01) %β^-n: value recommended in 1993Ru01 and 2002Pf04 based on the following measurements: 2.5 *5* (1980Lu04), 2.52 *52* (1986ReZU), 3.92 *19* (1993Ru01). %IT: Estimated by the evaluators assuming only M4 γ directly to g.s., and B(M4)(W.u.)<30 from general policies in Nuclear Data Sheets. E(level): from measured mass excess=−72379 keV *4* (2013Ka08) for (1/2$^-$), 1.3-s isomer using JYFL Penning-trap system (2013Ka08), and mass excess=−72837.9 keV *26* (2012Wa38,2012Ha25) for g.s. of ^{129}In. Earlier value of 369 keV *46* (2004Ga24) determined from β^- end-point energies from the decay of the 1.3-s and 611-ms activities is much less precise and deviates by ≈2σ from value deduced from direct mass measurements by 2013Ka08 and 2012Ha25. $T_{1/2}$: average value of 1.26 s *2* (1980Lu04) and 1.18 s *2* (1986ReZU). Other: 0.8 s *3* (1970OsZZ,1974Gr29,1975Al11) for either or both 0.61-s and 1.23-s activities.
858.8? *4*	(5/2)		A	
995.17 *17*	(11/2$^+$)		AB	Configuration=$\nu h^{-2}_{11/2}\otimes\pi g^{-1}_{9/2}$.
1020.5? *4*	(5/2)		A	
1091.0? *4*	(3/2$^-$)		A	
1354.14 *17*	(13/2$^+$)		AB	Configuration=$\nu h^{-2}_{11/2}\otimes\pi g^{-1}_{9/2}$.
1422.8 *4*	(5/2$^+$)		A	
1562.0? *4*	(5/2)		A	
1585.7 *5*	(9/2$^+$)		A	

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Adopted Levels, Gammas (continued)

^{129}In Levels (continued)

E(level)†	J$^{\pi}$‡	$T_{1/2}$	XREF	Comments
1630 *56*	(23/2$^-$)	0.67 s *10*	C	%β^-≈100; %IT=? $T_{1/2}$: from γ(t) (2004Ga24,1998FoZY). E(level): from 2004Ga24, based on beta decay energies.
1632.8? *7*	(5/2$^-$)		A	
1687.97 *25*	(17/2$^-$)	8.7 μs *7*	AB	%IT=100 $T_{1/2}$: weighted average of 8.5 μs *5* (2003Ge04) and 11.3 μs *+22−16* (2012Ka36). J$^{\pi}$: (M2) γ to (13/2$^+$). Configuration=$\nu(d_{3/2})^{-1}(h_{11/2})^{-1}\otimes\pi g_{9/2}^{-1}$.
1911 *56*	(29/2$^+$)	110 ms *15*	C	%IT≈100; %β^-=? $T_{1/2}$: from ^{129}In IT decay (110 ms) (2004Ga24,1998FoZY). J$^{\pi}$: (E3) γ to (23/2$^-$).
2419.2 *4*	(13/2$^-$)		A	
2918.9? *4*	(5/2)		A	
3150.2 *4*	(13/2$^-$)		A	
3183.9 *4*			A	
4578.9? *4*	(5/2$^-$)		A	

† From least-squares fit to Eγ data, keeping energy of 459-keV isomer fixed.
‡ From shell-model predictions and systematics of neighboring nuclides, unless otherwise stated.

$\gamma(^{129}In)$

E_i(level)	J_i^{π}	E_{γ}†	I_{γ}‡	E_f	J_f^{π}	Mult.	α#	Comments
858.8?	(5/2)	400.5@ *5*	100 *20*	459	(1/2$^-$)			
		858.1@ *5*	47 *10*	0.0	(9/2$^+$)			
995.17	(11/2$^+$)	995.2 *2*	100	0.0	(9/2$^+$)			
1020.5?	(5/2)	561.7@ *5*	94 *19*	459	(1/2$^-$)			
		1020.3@ *5*	100 *20*	0.0	(9/2$^+$)			
1091.0?	(3/2$^-$)	631.9 *5*	100	459	(1/2$^-$)			
1354.14	(13/2$^+$)	359.0 *2*	100 *10*	995.17	(11/2$^+$)			
		1354.1 *2*	42 *4*	0.0	(9/2$^+$)			
1422.8	(5/2$^+$)	1422.6 *5*	100	0.0	(9/2$^+$)			
1562.0?	(5/2)	1103.4@ *5*	100 *20*	459	(1/2$^-$)			
		1561.5@ *5*	100 *20*	0.0	(9/2$^+$)			
1585.7	(9/2$^+$)	1585.7 *5*	100	0.0	(9/2$^+$)			
1632.8?	(5/2$^-$)	541.8@ *5*	100	1091.0?	(3/2$^-$)			
1687.97	(17/2$^-$)	333.8 *2*	100	1354.14	(13/2$^+$)	(M2)	0.0816	α(K)=0.0697 *10*; α(L)=0.00968 *14*; α(M)=0.00190 *3* α(N)=0.000348 *5*; α(O)=2.51×10^{-5} *4* B(M2)(W.u.)=0.0312 *25* Mult.: α(K)exp in ^{129}In IT decay (8.7 μs) gives M2 or E3; former is more likely from systematics and configuration assignments to levels involved.
1911	(29/2$^+$)	281.0 *2*	100	1630	(23/2$^-$)	(E3)	0.1695	α(K)=0.1299 *19*; α(L)=0.0320 *5*; α(M)=0.00646 *10* α(N)=0.001123 *17*; α(O)=5.14×10^{-5} *8* B(E3)(W.u.)=0.069 *10* E_{γ}: from ^{129}In IT decay (110 ms) (2004Sc42,1998FoZY). Mult.: M2 or E3 from observation of K-x rays

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Adopted Levels, Gammas (continued)

$\gamma(^{129}In)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Comments
						(2004Ga24,1998FoZY), with preference for E3 from systematics of neighboring nuclides.
2419.2	(13/2$^-$)	731.1 *5*	100 *20*	1687.97	(17/2$^-$)	
		1065.2 *5*	94 *19*	1354.14	(13/2$^+$)	
2918.9?	(5/2)	2460.2[@] *5*	100 *20*	459	(1/2$^-$)	
		2918.5[@] *5*	17 *3*	0.0	(9/2$^+$)	
3150.2	(13/2$^-$)	1462.2 *5*	34 *3*	1687.97	(17/2$^-$)	
		1796.1 *5*	100 *9*	1354.14	(13/2$^+$)	
		2155.1 *5*	28 *6*	995.17	(11/2$^+$)	
3183.9		1760.9 *5*	100 *10*	1422.8	(5/2$^+$)	
		3184.1 *5*	16 *3*	0.0	(9/2$^+$)	
4578.9?	(5/2$^-$)	3487.8 *5*	50 *10*	1091.0?	(3/2$^-$)	
		4119.9 *5*	100 *20*	459	(1/2$^-$)	

[†] From ^{129}In IT decay (8.7 μs) when possible.
[‡] From ^{129}Cd β^- decay:mixed when multiple values are available.
[#] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[@] Placement of transition in the level scheme is uncertain.

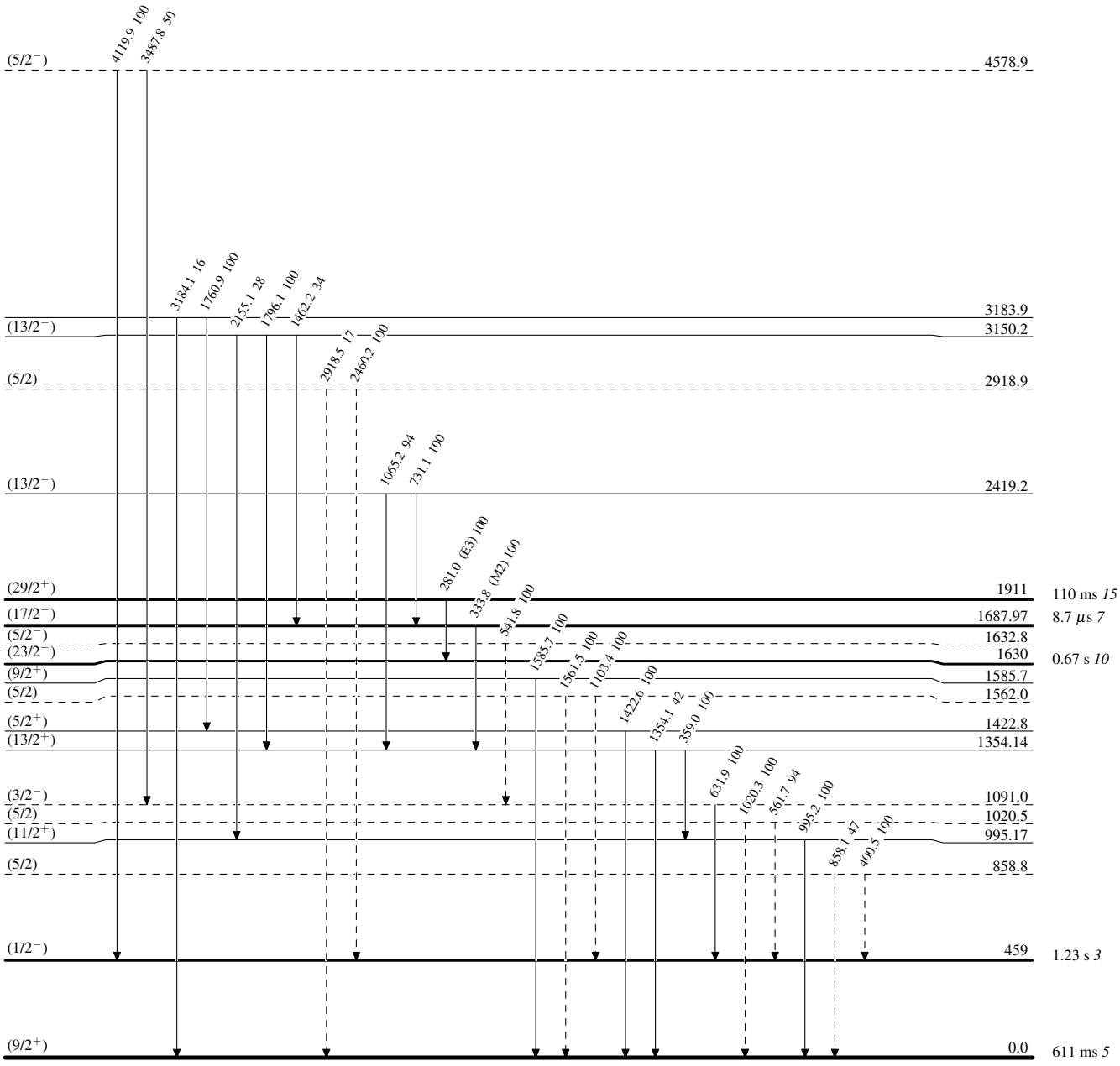
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{129}_{49}In_{80}$