^{106}Cd(^{54}Fe,α2pγ) 1993Zh10,1996Zh09

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 200,2 (2025)	22-Aug-2022

Additional information 1.

1993Zh10: ^{106}Cd(^{54}Fe,α2pγ) with E(^{54}Fe)=4.7 MeV/A. Pulsed beam (300-ns pulses). γ's were detected using the OSIRIS γ-detector array. A large-volume four-sector neutron detector, located at 0°, was used to identify unknown evaporation channels. Only Eγ values and a proposed level scheme are shown.

1996Zh09 report the results of a study of multiparticle yrast states involving the π $h_{11/2}$, ν $h_{9/2}$ and ν $f_{7/2}$ shell-model orbitals in the four N=84 nuclides from ^{151}Ho through ^{154}Yb. The level scheme was established via coincidence, $\gamma(\theta)$, and intensity information on the γ's measured using the 20-detector Nordball array. A diagram identifies yrast levels up through the J=(24$^+$) level.

1993Zh10 and (especially) 1996Zh09 give an extensive discussion of the results of the shell-model calculations as they apply to the level scheme of ^{154}Yb and the other N=84 nuclides from ^{151}Ho to ^{154}Tm.

^{154}Yb Levels

E(level)	J$^\pi$ †	T$_{1/2}$	Comments
0[a]	0$^+$‡		
821.0[a]	(2$^+$)‡		
1515.4[a]	(4$^+$)‡		
1948.8[a]	(6$^+$)‡		
2045.6[a]	(8$^+$)#	28 ns *2*	T$_{1/2}$: From 1993Zh10, $\gamma\gamma$(t). Other: T$_{1/2}$=45 ns *10*, from $\gamma\gamma$(t) in ^{154}Lu ε decay (1988Vi02).
2914.1[a]	(10$^+$)@		
3227.9	(11$^-$)		J$^\pi$: Based on the nearness of the energy separation of this level and the 8$^+$ state at 2046 to the energy of the 3$^-$ octupole excitation built on the ν $f_{7/2}$ state in ^{153}Yb (1989Mc01), from in-beam studies of the γ's from ^{102}Pd(^{54}Fe,2pn), 1993Zh10 assign J^π=(11$^-$) to this level. Presumably, it is the 3$^-$ octupole vibration built on the first 8$^+$ state in ^{154}Yb. Its observed decay mode (a single γ transition to the (10$^+$) level) is consistent with an (11$^-$) assignment.
3695.8[a]	(12$^+$)@		
4318.2[a]	(14$^+$)@		
4478.5[a]	(16$^+$)&	18.6 ns *15*	T$_{1/2}$: From 1993Zh10, γ(t$_{rf}$) for the 622, 782 and 869 γ's.
4607.6	(16$^+$)@		J$^\pi$: Maximum-aligned state of the $(\pi\ h_{11/2})^2_{10+}(\nu\ f^2_{7/2})$ configuration (1993Zh10).
4995.5[a]	(17$^+$)&		
5177.3[a]	(18$^+$)&		
5369.5			
5382.2			
5516.8			
5536.6			
5737.5			
5877.4			
6177.5			
6282.6[a]	(20$^+$)		
6342.2	(20)		
6665.6			
6795.8[a]	(21$^+$)		
6983.8[a]	(22$^+$)		
7186.5	(22)		
7245.2			
7438.9			
7609.2[a]	(24)		

Continued on next page (footnotes at end of table)

^{106}Cd(^{54}Fe,α2pγ) 1993Zh10,1996Zh09 (continued)

^{154}Yb Levels (continued)

† 1993Zh10 state that their reported J^π values are strongly supported by the systematics of the yrast levels in the N=84 nuclides. 1996Zh09, by the same authors, state that the results of their measurements confirm the assignments of 1993Zh10 up through the 18^+ level. Both articles state that the results of multiparticle shell-model calculations lend support to the proposed J^π and configuration assignments for the members of the positive-parity yrast level sequence.

‡ Configuration=$((\pi h^6_{11/2})(\nu f^2_{7/2}))$.

Configuration=$((\pi h_{11/2+6})(\nu h_{9/2})(\nu f_{7/2}))$.

@ Configuration=$((\pi h^4_{11/2})_{0+}(\pi h^2_{11/2})_{10+}\ (\nu f^2_{7/2}))$.

& Configuration=$((\pi h^4_{11/2})_{0+}(\pi h^2_{11/2})_{10+}\ (\nu h_{9/2})(\nu f_{7/2}))$.

a Seq.(A): Level sequence based on 0^+ ground state.

γ(^{154}Yb)

E_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α ‡	Comments
96.8	2045.6	(8^+)	1948.8	(6^+)	E2	3.64	Mult.: From α_K(exp)=1.3 *3*, from intensity of Yb K x rays relative to Iγ(96.8) measured in coincidence with positrons in the ^{154}Lu ε decay (1988Vi02).
129.1	4607.6	(16^+)	4478.5	(16^+)			
139.9	5877.4		5737.5				
160.3	4478.5	(16^+)	4318.2	(14^+)	(E2)	0.571	Mult.: From intensity balance and level $T_{1/2}$ (1993Zh10).
181.8	5177.3	(18^+)	4995.5	(17^+)	(M1)	0.620	Mult.: 1993Zh10 indicate that mult=M1 is measured for this γ, but do not present the data from which this conclusion is drawn.
188.0	6983.8	(22^+)	6795.8	(21^+)			
300.1	6177.5		5877.4				
313.8	3227.9	(11^-)	2914.1	(10^+)			
318.3	6983.8	(22^+)	6665.6				
323.4	6665.6		6342.2	(20)			
339.5	5516.8		5177.3	(18^+)			
374.0	5369.5		4995.5	(17^+)			
383.0	6665.6		6282.6	(20^+)			
390.7	7186.5	(22)	6795.8	(21^+)			
433.4	1948.8	(6^+)	1515.4	(4^+)			
513.2	6795.8	(21^+)	6282.6	(20^+)			
517.0	4995.5	(17^+)	4478.5	(16^+)			
545.1	6282.6	(20^+)	5737.5				
560.2	5737.5		5177.3	(18^+)			
579.6	7245.2		6665.6				
604.7	6342.2	(20)	5737.5				
622.4	4318.2	(14^+)	3695.8	(12^+)			
625.4	7609.2	(24)	6983.8	(22^+)			
694.4	1515.4	(4^+)	821.0	(2^+)			
698.9	5177.3	(18^+)	4478.5	(16^+)			
781.7	3695.8	(12^+)	2914.1	(10^+)			
821.0	821.0	(2^+)	0	0^+			
868.5	2914.1	(10^+)	2045.6	(8^+)			
903.7	5382.2		4478.5	(16^+)			
1058.1	5536.6		4478.5	(16^+)			
1156.3	7438.9		6282.6	(20^+)			

† Values shown by 1993Zh10.

‡ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with "Frozen Orbitals" approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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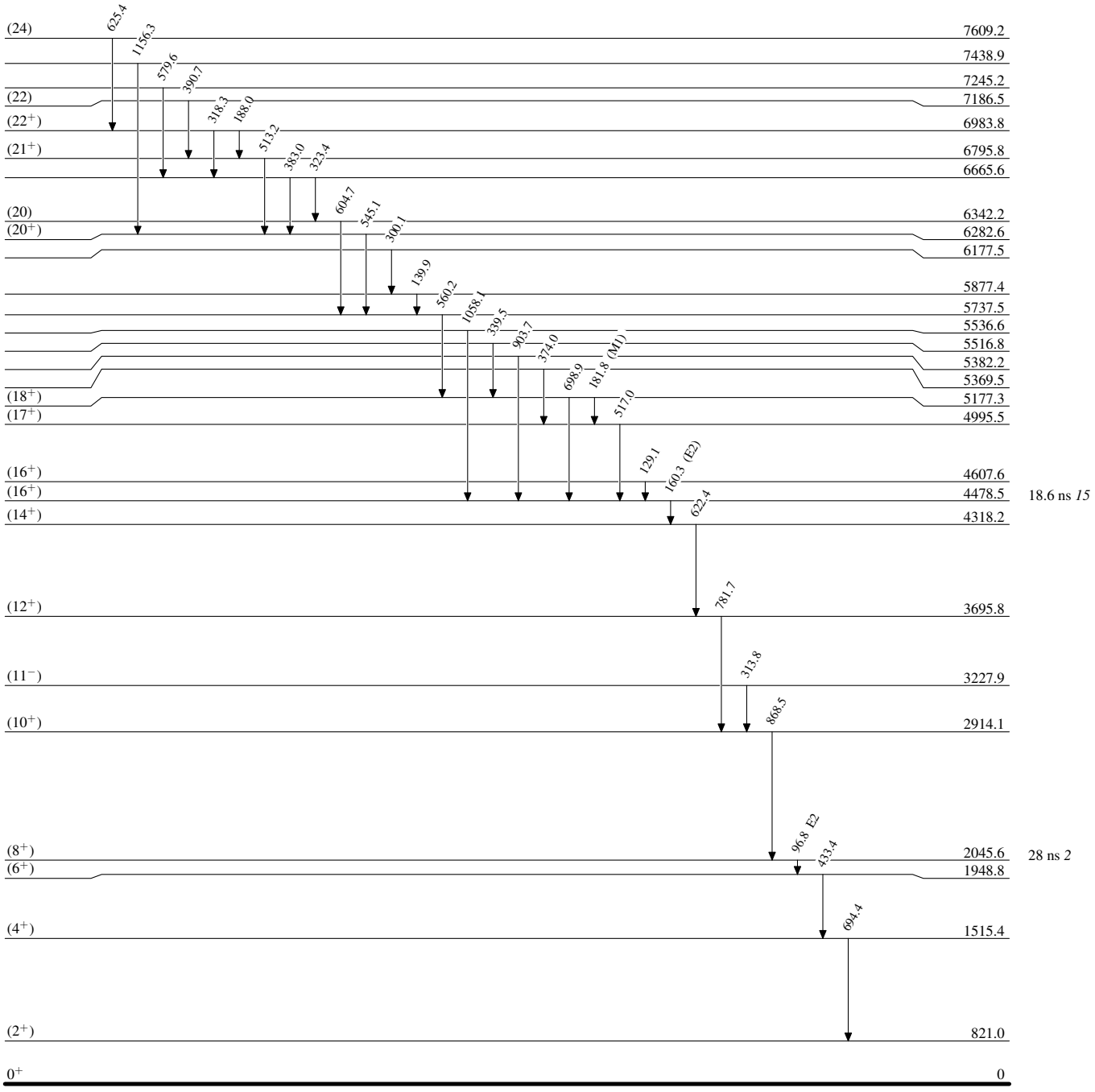
Level Scheme



$^{154}_{70}Yb_{84}$

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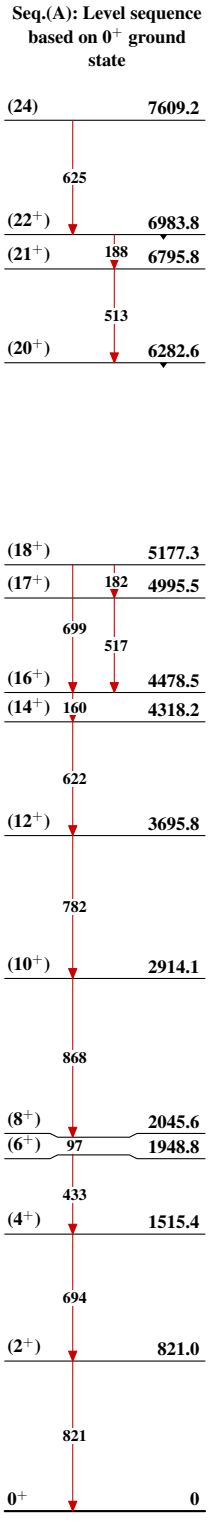

$^{154}_{70}Yb_{84}$