^{14}C(^{18}O,pnγ) 2010St13,1983Ko38

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia, A. Chakraborty	NDS 197,1 (2024)	31-May-2024

2010St13: 90% enriched ^{14}C target bombarded with a 37 MeV ^{18}O beam at ANL Tandem Linear Accelerator System; Fragment Mass Analyzer, parallel-plate gridded avalanche counter (PGAC), Gammasphere array, consists of 101 Compton-suppressed HPGe detectors, Measured: Eγ, Iγ, $\gamma(\theta)$, DCO, γ-γ coin, time-of-flight parameter, deduced level scheme. Comparison with shell-model calculations.

1983Ko38: ^{14}C target bombarded with a 25 MeV ^{18}O beam; two n-type HPGe detectors at 90° and 55°; Measured: Eγ, pγ coin, Iγ(branching), $\gamma\gamma$ coin, $\gamma(\theta)$, lifetimes. The results were compared with shell model calculations.

^{30}Al Levels

E(level)[†]	J$^\pi$	T$_{1/2}$[&]	Comments
0	3$^+$		J$^\pi$: from Adopted Levels.
243.92 *8*	2$^+$[#]	<8 ns	J$^\pi$: 443γ M1 feeding this state from 1$^+$. Anisotropic distribution of 244γ rules out 0$^+$ and assigned (1,2) by 1983Ko38. 243.9γ D to 3$^+$ and 2$^+$ presented by 2010St13. T$_{1/2}$: 3 ps<T$_{1/2}$<8 ns (1983Ko38).
687.54 *12*	1$^+$	0.7 ps *2*	J$^\pi$: from 443γ flat patterned angular distribution and mean-life (1983Ko38).
991.0 *9*	(2,3,4)[#]	97 fs *55*	E(level): level from 1983Ko38 and not reported in 2010St13. J$^\pi$: 991γ D to 3$^+$ state.
1118.36 *12*	3$^+$	83 fs *55*	J$^\pi$: 874.8γ M1 to 2$^+$ state.
1243.97 *10*	(4)[#]	118 fs *55*	
1799.6 *4*			
2017.0 *5*			
2296.61 *13*	4		J$^\pi$: 2296.8γ D to 3$^+$.
2433.7 *4*			
2843.3 *3*			
2902.97 *12*	5[‡]		J$^\pi$: γ-transitions to J=4, (4) states.
3458.6 *5*			
3898.28 *16*	6		J$^\pi$: 995.3γ D to 5.
4570.7 *7*	(5,6)		J$^\pi$: populated by 6414 keV level (J=7) and 3326.8γ feeding J=(4) state.
5358.5 *10*	(6)[@]		J$^\pi$: γ-transitions to J=6 and J=5.
5415.1 *14*			
5500.72 *19*	7[‡]		J$^\pi$: 1602.4γ D to J=6 state and 2595.5γ to J=5 state.
6414.2 *6*	7		J$^\pi$: assigned in 2010St13 considering 2515.7γ as D (as reported in (^{14}C,pnγ)–2008Hi05) feeding the J=6 state.
7240.6 *4*	(8)[@]		
9373.1 *14*	(9)[‡@]		

[†] From a least squares fit to the γ-ray energies.

[‡] Authors (2010St13) note that J=9 to 5 (spin 4 in text, possibly a misprint) sequence from 9373 to 2902.98 (2296 in the text probably a misprint – because for a J=4 it is not a ΔJ=2 transition from 2902.98, J=5) keV level connected by ΔJ=2 transitions and of common parity. It appears that ΔJ=2 transition is valid up to 2902.97 keV level.

[#] π is either '+' or '–'.

[@] Assigned by 2010St13 on the basis of yrast-feeding and structural systematics.

[&] From 1983Ko38 using the DSA method, given as upper limits.

$^{14}C(^{18}O,pn\gamma)$ 2010St13,1983Ko38 (continued)

$\gamma(^{30}Al)$

R_{DCO} ratios ≈1.0 and ≈0.5-0.6 for stretched-quadrupole and stretched-dipole transitions, respectively, for gates set on stretched-quadrupole and stretched-dipole transitions, respectively.

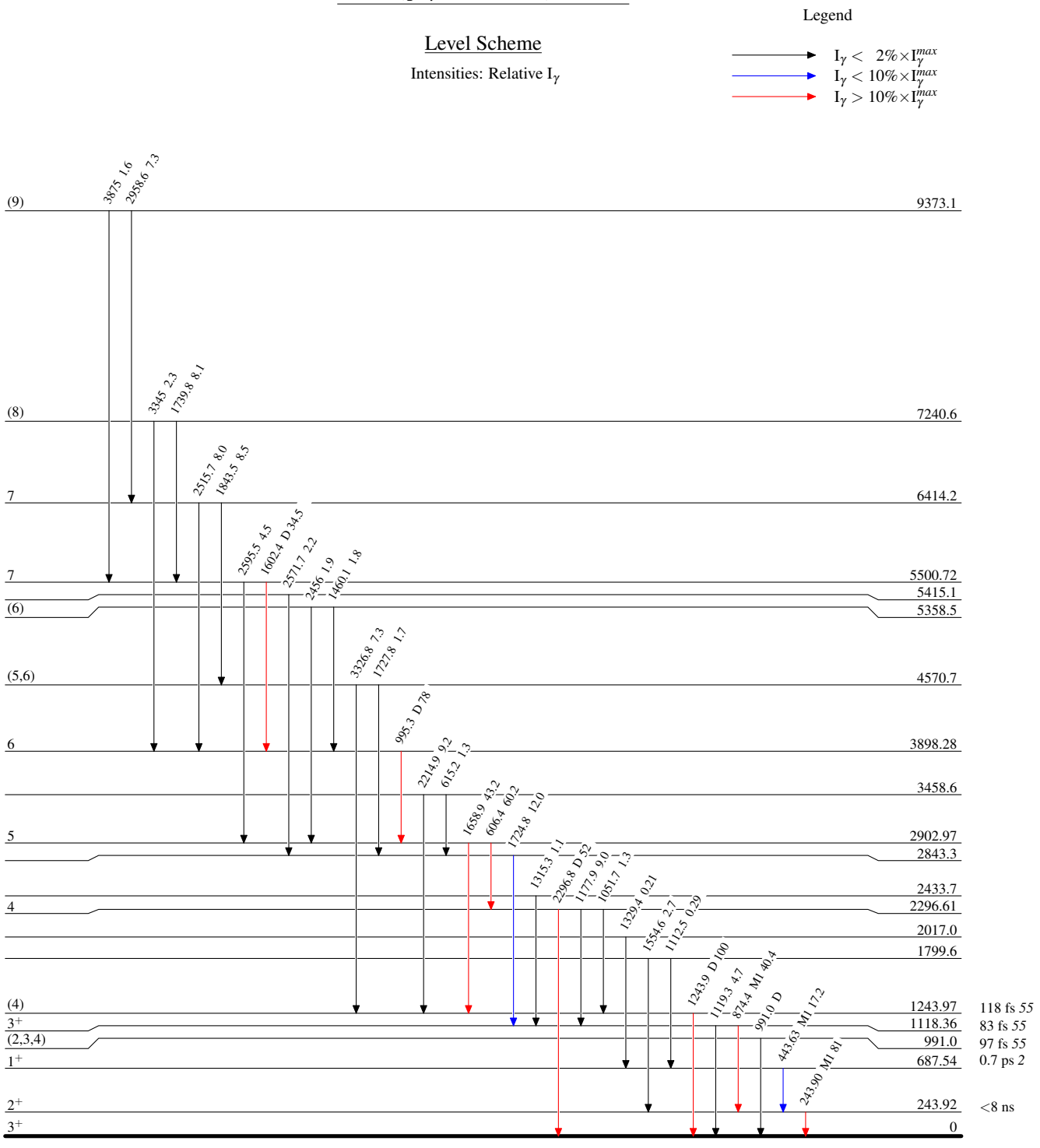
E_γ [†]	I_γ [#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
243.90[‡] *8*	81 *4*	243.92	2^+	0	3^+	M1[@]	A_2=−0.12 *3*; A_4=−0.03 (1983Ko38) A_2=−0.04 (2010St13) E_γ: other: 242.9 *1* (2010St13). Mult.: from R_{DCO}=1.0 *2* (2010St13).
443.63[‡] *8*	17.2 *7*	687.54	1^+	243.92	2^+	M1[@]	A_2=+0.07 *11*; A_4=−0.08 *11* (1983Ko38) A_2=−0.06 *6* (2010St13) E_γ: other: 442.8 *1* (2010St13).
606.4 *1*	60.2 *23*	2902.97	5	2296.61	4		R_{DCO}=1.0 *2* (2010St13).
615.2 *4*	1.3 *2*	3458.6		2843.3			
874.4 *1*	40.4 *15*	1118.36	3^+	243.92	2^+	M1[@]	A_2=+0.19 *15*; A_4=+0.03 *16* (1983Ko38) Mult.: from $\gamma(\theta)$ and R_{DCO}=1.0 *1* (2010St13).
991.0[‡] *9*		991.0	(2,3,4)	0	3^+	D	0.23 W.u. *13* for M1 and (7.4 *42*) × 10^{-3} W.u. for E1 (1983Ko38).
995.3 *1*	78 *3*	3898.28	6	2902.97	5	D	A_2=−0.14 *3* (2010St13) Mult.: assigned by 2010St13 based on $\gamma(\theta)$.
1051.7 *14*	1.3 *3*	2296.61	4	1243.97	(4)		
1112.5 *4*	0.29 *16*	1799.6		687.54	1^+		
1119.3 *13*	4.7 *11*	1118.36	3^+	0	3^+		
1177.9 *4*	9.0 *5*	2296.61	4	1118.36	3^+		
1243.9 *1*	100 *4*	1243.97	(4)	0	3^+	D	A_2=−0.11 *9*; A_4=−0.06 *10* (1983Ko38) A_2<0 (2010St13) R_{DCO}=1.2 *3* (2010St13).
1315.3 *3*	1.1 *1*	2433.7		1118.36	3^+		
1329.4 *4*	0.21 *12*	2017.0		687.54	1^+		
1460.1 *10*	1.8 *4*	5358.5	(6)	3898.28	6		
1554.6 *6*	2.7 *4*	1799.6		243.92	2^+		
1602.4 *1*	34.5 *14*	5500.72	7	3898.28	6	D	Mult.: from R_{DCO}=1.2 *3* (2010St13).
1658.9 *1*	43.2 *18*	2902.97	5	1243.97	(4)		R_{DCO}=1.5 *4* (2010St13).
1724.8 *3*	12.0 *9*	2843.3		1118.36	3^+		
1727.8 *16*	1.7 *4*	4570.7	(5,6)	2843.3			
1739.8 *3*	8.1 *6*	7240.6	(8)	5500.72	7		
1843.5 *6*	8.5 *9*	6414.2	7	4570.7	(5,6)		
2214.9 *8*	9.2 *12*	3458.6		1243.97	(4)		
2296.8 *2*	52 *3*	2296.61	4	0	3^+	D	A_2=−0.27 *6* (2010St13) R_{DCO}=1.1 *3* (2010St13). Mult.: based on $\gamma(\theta)$ and DCO data in 2010St13.
2456 *3*	1.9 *9*	5358.5	(6)	2902.97	5		
2515.7 *6*	8.0 *8*	6414.2	7	3898.28	6		
2571.7 *13*	2.2 *4*	5415.1		2843.3			
2595.5 *16*	4.5 *5*	5500.72	7	2902.97	5		
2958.6 *13*	7.3 *12*	9373.1	(9)	6414.2	7		
3326.8 *18*	7.3 *15*	4570.7	(5,6)	1243.97	(4)		
3345 *4*	2.3 *2*	7240.6	(8)	3898.28	6		
3875 *7*	1.6 *9*	9373.1	(9)	5500.72	7		

[†] From 2010St13, except otherwise noted.
[‡] From 1983Ko38.
[#] From 2010St13. Branching from 1983Ko38.
[@] From comparison of experimental transition strength (W.u.) (M1) with calculation, except otherwise noted. E2 transition strengths were not given (1983Ko38).

$^{14}C(^{18}O,pn\gamma)$ **2010St13,1983Ko38**

Level Scheme

Intensities: Relative I_γ



$^{30}_{13}Al_{17}$