Adopted Levels, Gammas

History

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

Q(β^-)=8568.8 *19*; S(n)=5727.7 *20*; S(p)=12540.7 *20*; Q(α)=−11428 *4* 2021Wa16
S(2n)=15156.0 *19*, S(2p)=29454 *10* (2021Wa16).

2012Zh06: Production cross sections ~1.1 mb and ~1.5 mb were measured in fragmentation of ^{9}Be(^{40}Ar,X) and ^{181}Ta(^{40}Ar,X), E=57 MeV/nucleon, respectively.

2007No13: ^{30}Al production cross section ~3 mb and ~8 mb were measured in ^{40}Ar fragmentation reactions of ^{9}Be(^{40}Ar,X), E=90A MeV, and ^{181}Ta(^{40}Ar,X), E=94A MeV, respectively.

In 2006Kh08, 57.08 MeV/A beams of ^{30}Al impinged on a Si target, measured σ=2281 mb *515* for the Si(^{30}Al,x) reaction and a reduced strong absorption radius of $<r_0^2>$=1.2 fm^2 *3* is deduced and used to study the isospin dependence. 1999Ai02 at E=43.40 MeV/A measured σ=2047 mb *124* and $<r_0^2>$=1.12 fm^2 *7*.

1997Vo03: Production cross section σ < 0.29 mb was measured for ^{30}Al production from ^{56}Fe+800 MeV protons determined by activation.

1971Ar32: ^{232}Th(^{40}Ar,X), E=290 MeV; measured fragments isotopic yields.

1963Pe25: Si(n,X), E=14 MeV, measured a half-life of 72.5 s *13* from 2.5-3.5γ(t). In 1963Pe25, the activity was speculated from ^{30m}Al – not confirmed by any other work. No comparable g.s. or isomeric half-life is present for the isotopes from the ^{28,29,30}Si(n,X), X=p,n′,α, reactions. 1971Gr19 searched for the 72.5 s ^{30m}Al state and did not find any.

^{30}Al Levels

Cross Reference (XREF) Flags

A	^{30}Mg β^- decay (319 ms)	D	^{30}Si(μ^-,$\nu\gamma$)
B	^{14}C(^{18}O,pnγ)	E	^{30}Si(t,^{3}He)
C	^{18}O(^{14}C,pnγ)	F	^{30}Si(^{7}Li,^{7}Be)

E(level)[†]	J$^\pi$	T$_{1/2}$[a]	XREF	Comments
0	3$^+$	3.62 s *6*	ABCDEF	%β^-=100 μ=+3.027 *4* Q=+0.121 *8* Mean-square charge radius $\delta<r^2>$=+0.164 fm^2 *15*(stat) *132*(syst) *196*(syst, for atomic calculation of M and F) (2021He04). J$^\pi$: from absence of β^- feeding (from J^π=0$^+$) in ^{30}Mg β^- decay (2008Hi05) and comparison of measured ^{30}Si(t,^{3}He) dσ/dΩ cross sections with DWBA calculation (1987Pe06). T$_{1/2}$: using limitation of weighted average (LWM): 3.685 s *32* (1974Al09 – γ(t) – five spectra of 3 sec each) and 3.56 s *2* (1974Kl07) (discrepant data). Other: 3.27 s *20* (1961Ro12). μ: from 2021He04 – collinear laser spectroscopy. Other: 3.012 *7* (2019StZV, 2005Ue01, 2007Ue02) – Using β^-Nuclear Magnetic Resonance method. Q: from 2021He04 – collinear laser spectroscopy. Not reported in 2021StZZ.
243.90 *8*	2$^+$	15 ps *4*	ABCDEF	J$^\pi$: from absence of β^- feeding (from J^π=0$^+$) in ^{30}Mg β^- decay (2008Hi05), 244γ M1 to 3$^+$, J^π=1$^+$,2$^+$ from comparison of measured ^{30}Si(t,^{3}He) cross sections with DWBA calculations (1987Pe06). T$_{1/2}$: from ^{30}Mg β- decay. Other: 3 ps<T$_{1/2}$<8 ns – (^{18}O,pnγ).
687.66 *10*	1$^+$	0.7 ps *2*	ABCDEF	J$^\pi$: from β^- feeding from 0$^+$, log *ft*=3.92. J$^\pi$=1$^+$,2$^+$ from comparison of measured ^{30}Si(t,^{3}He) cross sections with DWBA calculations (1987Pe06).
991.0 *9*	(2,3,4)	97 fs *55*	B E	XREF: E(1000). J$^\pi$: 991γ D to 3$^+$ state.
1118.45 *19*	3$^+$,2$^+$	83 fs *55*	BC EF	XREF: E(1135).

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Adopted Levels, Gammas (continued)

^{30}Al Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[a]	XREF	Comments
				Jπ: from 875γ(θ) (^{14}C,pnγ)–2008Hi05 suggest 3$^+$,(2$^+$). 875γ M1 to 2$^+$. 2$^+$,(3$^+$) in ^{30}Si(t,^{3}He).
1243.95 *10*	(4$^+$)[&]	118 fs *55*	BC EF	XREF: E(1256). Jπ: also (5$^+$) is possible. 1243.9γ feeding 3$^+$ g.s.
1800.1 *3*	(2,3$^+$)		ABC	Jπ: γ to 1$^+$ and 2$^+$ states.
1822 *17*			E	
2017.1 *5*			B	
2296.64 *19*	(3,4)		BC	Jπ: 2296.9γ D to 3$^+$, γ from (5).
2303[‡] *15*	3,4[&]		EF	XREF: F(2322).
2412.63 *14*	1$^+$		A	Jπ: from β$^-$ feeding from Jπ=0$^+$ in ^{30}Mg β$^-$ decay, log *ft*=4.31.
2433.8 *4*			B	
2454[‡] *20*			EF	XREF: F(2455).
2744[‡] *15*			EF	XREF: F(2738).
2843.3 *4*			BC	
2902.98 *19*	(5)[#]		BC EF	T=2 XREF: E(2892). Jπ: γ-transitions to J=(4), (4$^+$) states. 4,5 in (t,^{3}He) with a possibility of 5$^+$ based on predictions.
3164.2 *4*	1$^+$		A	Jπ: populated from 0$^+$ in ^{30}Mg β$^-$ decay, log *ft*=5.3.
3362.87 *22*	1$^+$		A F	XREF: F(3396). Jπ: populated from 0$^+$ in ^{30}Mg β$^-$ decay, log *ft*=4.95.
3458.6 *5*			BC EF	
3705 *17*			E	
3898.29 *21*	(6)[#]		BC E	Jπ: other: 5$^+$ based on measured dσ/dΩ and DWBA calculations in (t,^{3}He) (1989Cl07).
4009 *10*	(2)[&]		E	
4201 *19*			E	
4463 *15*			E	
4570.7 *7*	(5,6$^+$)		B	Jπ: γ to (4$^+$) and γ from J=(7).
4694 *15*			E	
4814 *15*	3,4[&]		E	
5358.5 *10*	(6)[@]		B	
5415.1 *14*			B E	
5500.73 *23*	(7)[#]		BC	XREF: C(5509).
5553 *15*			E	
5901 *19*			E	
6414.2 *6*	(7)[#]		BC	Jπ: assigned by 2010St13 (^{18}O,pnγ) considering 2515.7γ as D (as reported in (^{14}C,pnγ)–2008Hi05) feeding the J=(6) state.
7240.6 *4*	(8)[@]		B	
9373.1 *14*	(9)[@]		B	

[†] From a least squares fit to the γ-ray energies, when applicable.
[‡] From (t,^{3}He).
[#] Assignment from 2010St13 (^{18}O,pnγ).
[@] Assigned by 2010St13 (^{18}O,pnγ) on the basis of yrast-feeding and structural systematics.
[&] From comparison of measured dσ/dΩ and DWBA calculation in (t,^{3}He).
[a] From ^{14}C(^{18}O,pnγ), except otherwise noted. DSA method.

Adopted Levels, Gammas (continued)

$\gamma(^{30}Al)$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	α[&]	Comments
243.90	2^+	243.86 *8*	100	0	3^+	M1	3.44×10^{-4} *5*	α(K)=0.000320 *4*; α(L)=2.191×10^{-5} *31*; α(M)=1.163×10^{-6} *16* B(M1)(W.u.)=0.101 *+37−22* E_γ: weighted average of 243.8 *1* from ^{30}Mg β^- decay, 243.90 *8* from (^{18}O,pnγ), and 243.7 *5* from (^{14}C,pnγ). Mult.: from 244$\gamma(\theta)$ in (^{14}C,pnγ)−2008Hi05, (^{18}O,pnγ), and RUL.
687.66	1^+	443.70 *8*	100.0[‡] *21*	243.90	2^+	M1		B(M1)(W.u.)=0.35 *+14−8* E_γ: weighted average of 443.8 *1* from ^{30}Mg β^- decay, 443.63 *8* from (^{18}O,pnγ), and 444.1 *5* from (^{14}C,pnγ).
		687.7[‡#] *2*	4.4[‡] *20*	0	3^+	[E2]		B(E2)(W.u.)=40 *+26−18*
991.0	(2,3,4)	991.0 *9*	100	0	3^+	D		
1118.45	3^+,2^+	874.4 *2*	100 *4*	243.90	2^+	M1		B(M1)(W.u.)=0.36 *+39−15* E_γ: weighted average of 874.4 *1* from (^{18}O,pnγ) and 875.9 *9* from (^{14}C,pnγ).
		1119.9 *10*	11.6 *27*	0	3^+			E_γ: weighted average of 1119.3 *13* from (^{18}O,pnγ) and 1120.2 *10* from (^{14}C,pnγ). I_γ: other: 46 *9* (^{14}C,pnγ).
1243.95	(4^+)	1243.9 *1*	100	0	3^+	D		E_γ: other: 1246.2 *8* (^{14}C,pnγ).
1800.1	($2,3^+$)	1112.5 *4*	11 *6*	687.66	1^+			
		1554.6 *6*	100 *15*	243.90	2^+			E_γ: others: 1557.7 *2* ^{30}Mg β- decay, 1558.0 *16* (^{14}C,pnγ).
2017.1		1329.4 *4*	100	687.66	1^+			
2296.64	(3,4)	1051.7 *14*	2.5 *6*	1243.95	(4^+)			
		1177.9 *4*	17.3 *10*	1118.45	3^+,2^+			I_γ: other: 8.3 *15* (^{14}C,pnγ).
		2296.9 *3*	100 *6*	0	3^+	D		E_γ: weighted average of 2296.8 *2* from (^{18}O,pnγ) and 2298.4 *10* from (^{14}C,pnγ).
2412.63	1^+	611.1[‡#] *6*	8.3[‡] *21*	1800.1	($2,3^+$)			
		1724.6[‡#] *2*	100[‡] *35*	687.66	1^+			
		2169.1[‡#] *2*	67[‡] *6*	243.90	2^+			
		2412.6[‡#] *3*	6.3[‡] *21*	0	3^+			
2433.8		1315.3 *3*	100	1118.45	3^+,2^+			
2843.3		1724.8 *3*	100	1118.45	3^+,2^+			
2902.98	(5)	606.4 *2*	100 *4*	2296.64	(3,4)			E_γ: weighted average of 606.4 *1* from (^{18}O,pnγ) and 607.7 *9* from (^{14}C,pnγ).
		1658.9 *2*	72 *3*	1243.95	(4^+)			E_γ: weighted average of 1658.9 *1* from (^{18}O,pnγ) and 1661.5 *14* from (^{14}C,pnγ). I_γ: other: 43 *14* (^{14}C,pnγ).
3164.2	1^+	2476.4[‡] *3*	100	687.66	1^+			
3362.87	1^+	3118.8[‡] *2*	100	243.90	2^+			

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Adopted Levels, Gammas (continued)

γ(^{30}Al) (continued)

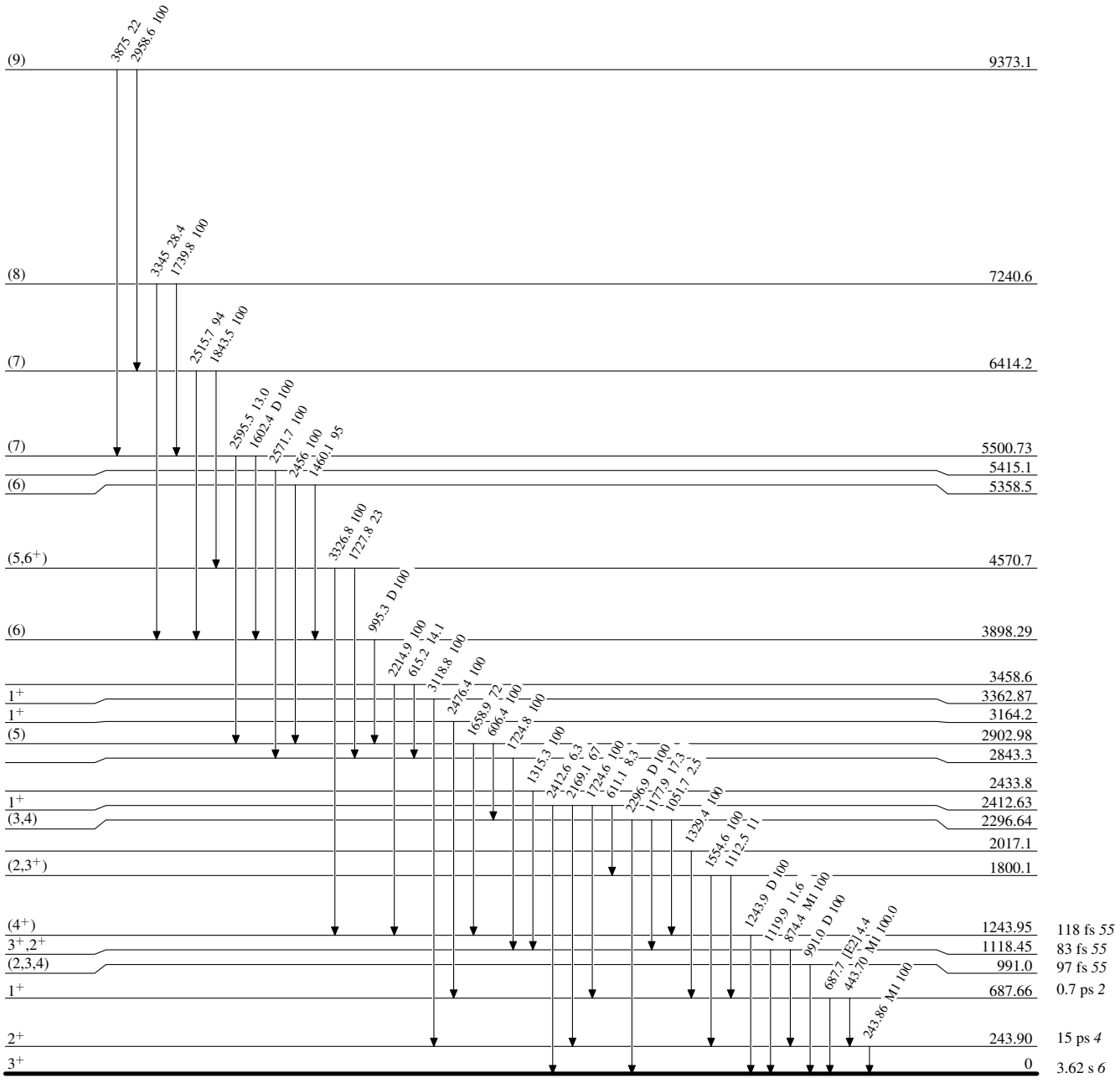
E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. @	Comments
3458.6		615.2 *4*	14.1 *22*	2843.3			
		2214.9 *8*	100 *13*	1243.95	(4$^+$)		E_γ: other: 2217.4 *15* (^{14}C,pnγ).
3898.29	(6)	995.3 *1*	100	2902.98	(5)	D	E_γ: other: 997.4 *13* (^{14}C,pnγ). Mult.: From (^{18}O,pnγ).
4570.7	(5,6$^+$)	1727.8 *16*	23 *5*	2843.3			
		3326.8 *18*	100 *21*	1243.95	(4$^+$)		
5358.5	(6)	1460.1 *10*	95 *21*	3898.29	(6)		
		2456 *3*	100 *47*	2902.98	(5)		
5415.1		2571.7 *13*	100	2843.3			
5500.73	(7)	1602.4 *1*	100 *4*	3898.29	(6)	D	E_γ: other: 1605.1 *25* (^{14}C,pnγ) placed differently from 3904.2 keV level. Mult.: from (^{18}O,pnγ).
		2595.5 *16*	13.0 *14*	2902.98	(5)		
6414.2	(7)	1843.5 *6*	100 *11*	4570.7	(5,6$^+$)		
		2515.7 *6*	94 *9*	3898.29	(6)		
7240.6	(8)	1739.8 *3*	100 *7*	5500.73	(7)		
		3345 *4*	28.4 *25*	3898.29	(6)		
9373.1	(9)	2958.6 *13*	100 *16*	6414.2	(7)		
		3875 *7*	22 *12*	5500.73	(7)		

† From ^{14}C(^{18}O,pnγ), except otherwise noted.
‡ From ^{30}Mg β^- decay.
# Weighted average of data from (^{18}O,pnγ) and (^{14}C,pnγ).
@ From (^{18}O,pnγ), assigned in 1983Ko38 based on measured γ(θ) and RUL, except otherwise noted.
& Additional information 1.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



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