^{30}Si(α,$\alpha'\gamma$) 1970Du03,1970Oh03

History

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

Others: 1968Go09, 1975Eb01, 1982Sa15 (α,α'), 1994Gr25 (α,α').

1970Du03: (α,$\alpha'\gamma$) – enriched (96%) ^{30}Si target (thickness=50 μg/cm^2), E_α=14.5 MeV; scattered α particles were detected by an annular counter at 180° to the beam direction; measured α-γ angular correlation; deduced level spin and parity. Also studied ^{27}Al(α,pγ).

1970Oh03: SiO_2 target (thickness=100 or 200 μg/cm^2) of enriched (95.55%) ^{30}Si; E_α=13.015 and 16.020 MeV; inelastic α-particles were detected by a 100μm thick annular silicon surface barrier counter at 180° to the beam direction; measured γ with a Ge(Li) between 30° to 145° to the incident beam in step of 5°; measured $\alpha\gamma$ coin, Eγ, γ-branching, $\gamma(\theta)$, α groups at 90°; deduced excited levels, spin, parity. FWHM (Ge(Li)) = 7 keV at 1332 keV.

^{30}Si Levels

E(level)[†]	J$^\pi$[#]	$T_{1/2}$	Comments
0	0^+		
2235.32 *2*	2^+	0.249 ps *27*	g−factor +0.56 *16* (1975Eb01). $T_{1/2}$: from τ=0.36 ps *4* (1975Eb01 DSAM).
3498.49 *3*	2^+		
3769.48 *4*	(1^+)		E(level),J$^\pi$: doublet, 3.8 × 10^3, in 1970Oh03. Estimated population is one-tenth to that of 3787 level (2/5th at E=16 MeV), noted by authors and propose unnatural parity on this basis and further analysis of $\alpha\gamma(\theta)$ data discarded 1^- assignment.
3787.72 *5*	0^+		E(level): doublet, 3.8 × 10^3, in 1970Oh03.
4810	2^+		E(level): doublet, 4.8 × 10^3, in 1970Oh03. J$^\pi$: 2 from $\alpha\gamma$(4810)(θ), natural parity from stronger population (1970Oh03).
4831	(2^+)		E(level): other: 4.8 × 10^3 (1970Oh03). J$^\pi$: 2 from $\gamma\gamma(\theta)$ measurements, expected natural parity and feeding from 3^+ at 5230, 1970Oh03 propose (2^+). 3^+ in the Adopted Levels.
5231.52 *9*			E(level),J$^\pi$: 5222 in 1970Oh03, weakly populated with E_α=16 MeV and not populated with E_α=13 MeV, unnatural parity proposed by the authors.
5279.25 *13*	4^+[@]		J$^\pi$: other: $(4^+,2^+)$ (1970Oh03).
5372.2			
5487.49 *6*			
5614.05 *13*			
5950.69 *14*	4^+[@]		E(level): 5950 in 1970Du03. 5948 in 1970Oh03.
6503.42?[‡] *8*			E(level): other: 6496 (1970Oh03).
6537?[‡] *4*	$(2^+,3^-)$		E(level): other: 6528 (1970Oh03). J$^\pi$: 1970Oh03 confirm 2^+ of the literature data and excludes 1^- based on $\gamma\gamma(\theta)$ measurement.
6744.06?[‡] *4*	$(1^-,2^+,3^-)$		E(level): other: 6735 (1970Oh03).
6914.77?[‡] *25*			E(level): other: 6908 (1970Oh03).

[†] From the Adopted Levels.

[‡] Weakly populated in 1970Oh03.

[#] From 1970Oh03 (Fig. 8), except where otherwise noted. Spin parity assignments in 1970Oh03 are based on $\gamma\gamma(\theta)$, natural and unnatural parity expected from stronger and weaker populations.

[@] Spin 4 from α-$\gamma(\theta)$ and parity from expected excitation of natural parity states in the ^{30}Si(α,$\alpha'\gamma$) reaction, i.e. 0^+ target and 0^+ projectile (1970Du03).

^{30}Si($\alpha,\alpha'\gamma$) 1970Du03,1970Oh03 (continued)

$\gamma(^{30}Si)$

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.	δ	Comments
2235.32	2^+	2231[‡] *4*	100	0	0^+			
3498.49	2^+	1263.13 *3*	57	2235.32	2^+	D+Q	−0.13 *25*	Mult.,δ: from $\gamma(\theta)$ in 1970Oh03.
		3498.33 *5*	43	0	0^+			
3769.48	(1^+)	1534.12 *4*	<55	2235.32	2^+			E_γ: placement less certain in 1970Oh03.
		3766[‡] *7*	>45	0	0^+			
3787.72	0^+	1553[‡] *3*	100	2235.32	2^+			
4810	2^+	1022[#]	<35	3787.72	0^+			E_γ: from level energy difference. Comparable Eγ placed from 11210 keV level in the adopted dataset.
		1041	>65	3769.48	(1^+)			
		2574.8		2235.32	2^+			E_γ: doublet (2580 *15*) in 1970Oh03, not assigned in the level scheme.
4831	(2^+)	20[#]	<50	4810	2^+			E_γ: from level energy difference − assumed and uncertain in 1970Oh03, not adopted − no such γ in other studies.
		1332.48	>50	3498.49	2^+			E_γ: other: 1319 from level energy difference in 1970Oh03.
		2595.39		2235.32	2^+			E_γ: doublet (2580 *15*) in 1970Oh03, not assigned in the level scheme.
5231.52		1732.3 *8*	70	3498.49	2^+			
		2995.0 *8*	30	2235.32	2^+			
5279.25	4^+	3043.2 *1*	100	2235.32	2^+	Q		Mult.,δ: based on α-$\gamma(\theta)$ in 1970Du03. δ=−0.18 *30* was deduced by authors of 1970Oh03 if $J^\pi=4^+$ and δ=1.4 *6*, if 2^+, based on $\gamma\gamma(\theta)$ analysis.
5372.2		1602.8 *9*	40	3769.48	(1^+)			
		3136.6 *7*	60	2235.32	2^+			
5487.49		1989.02 *7*	40	3498.49	2^+			
		3252.00 *9*	60	2235.32	2^+			
5614.05		1844.40 *16*	<50	3769.48	(1^+)			
		3378.68 *25*	>50	2235.32	2^+			
5950.69	4^+	3713[‡] *6*	100	2235.32	2^+	Q		Mult.: based on α-$\gamma(\theta)$ in 1970Du03.
6503.42?		1223[#]	20	5279.25	4^+			E_γ: from level energy differences. Not in other studies, not adopted.
		1271.9 *2*	20	5231.52				
6537?	$(2^+,3^-)$	3038[#]	10	3498.49	2^+			
		4301[#]	10	2235.32	2^+			
		6536	30	0	0^+			E_γ: other: 6519 *30* (1970Oh03).
6744.06?	$(1^-,2^+,3^-)$	4508.64[#] *17*	20	2235.32	2^+			
		6743.22 *4*	80	0	0^+			E_γ: other: 6705 *25* (1970Oh03).
6914.77?		3415.7[#] *7*	30	3498.49	2^+			
		4679.2 *3*	20	2235.32	2^+			
		6913.7[#] *5*	50	0	0^+			

[†] From Adopted Gammas, except where otherwise noted.
[‡] From 1970Oh03.
[#] Placement of transition in the level scheme is uncertain.

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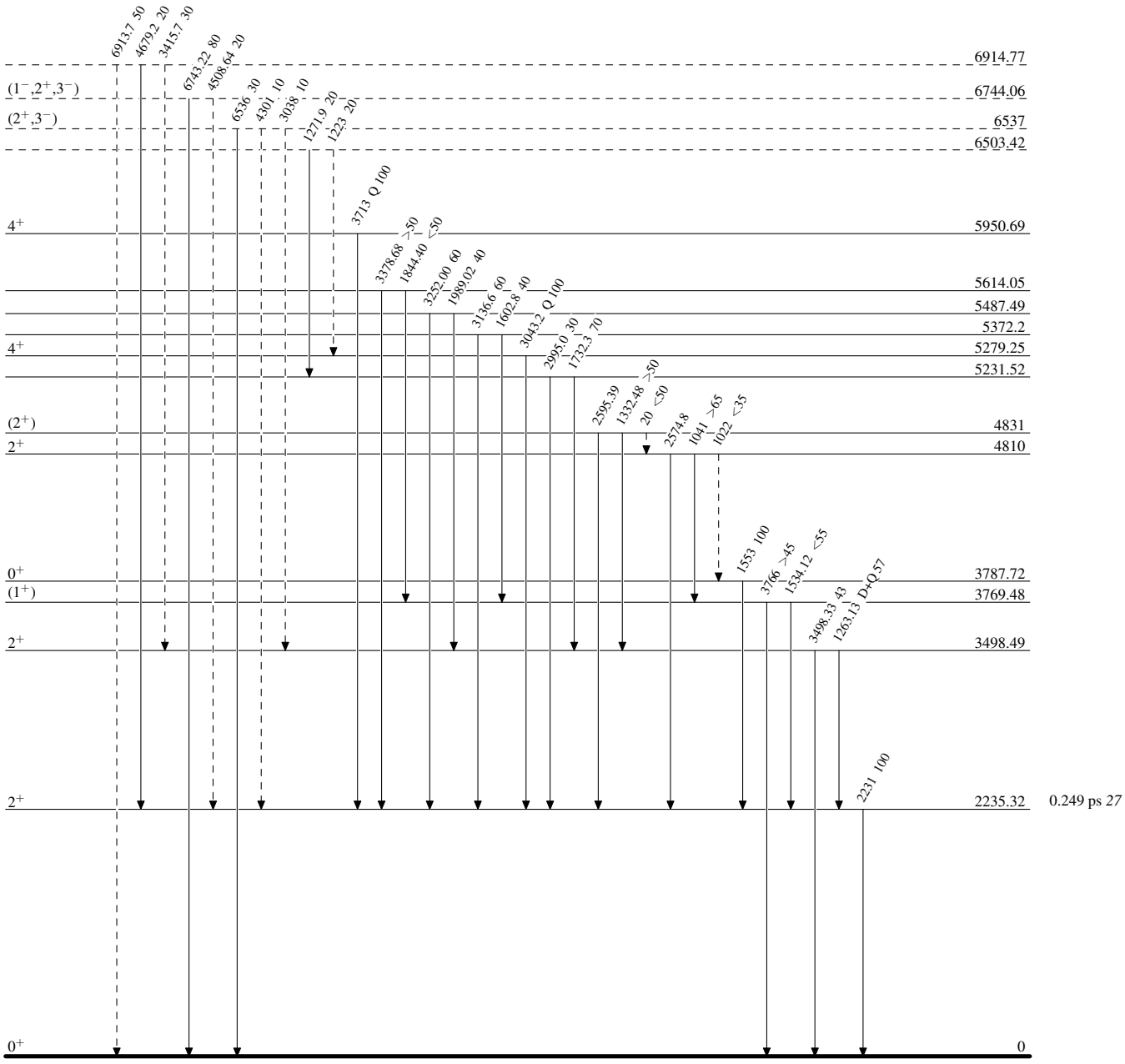
Legend

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{30}_{14}Si_{16}$