^{122}Sn(^{16}O,3nγ)   1974Gi01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Alexander A. Rodionov And Yuri L. Khazov	NDS 109, 517 (2008)	22-Jan-2008

1974Gi01: E=60-90 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$.

^{135}Ce Levels

The level scheme is based on $\gamma\gamma$-coincidence measurements, energy sums, intensity balance and excitation functions.

E(level)	Jπ[†]	T$_{1/2}$	Comments
0.0	1/2$^{(+)}$		
82.6 1	3/2$^{(+)}$		
296.0 2	(5/2$^+$)		
445.7 3	(11/2$^-$)	20 s 1	T$_{1/2}$: from Adopted Levels.
1035.6 6	(13/2$^-$)		
1145.1 6	(15/2$^-$)		
1669.9 8	(15/2$^-$)		
1869.6[#] 7	(17/2$^-$)		
2051.5 8	(19/2$^-$)		
2125.6 8	(19/2$^+$)	8.2 ns 4	g=$-$0.07 1 (1982Ze01)
			T$_{1/2}$: from 1982Ze01. Other: 8 ns 2 (1974Gi01).
			g: from $\gamma(\theta$,H).
2249.3?[‡#] 8	(19/2$^-$)		
2551.0 9	(23/2$^+$)		
2682.7?[‡] 9	(21/2$^-$)		
2888.6?[‡#] 13	(21/2$^-$)		
2946.2?[‡] 13	(23/2$^-$)		
3054.1?[‡#] 10	(21/2$^+$)		
3103.5?[‡] 14	(23/2$^-$)		
3229.2?[‡#] 10	(23/2$^+$)		
3431.3?[‡] 10	(25/2$^+$)		
3503.2?[‡] 14	(25/2$^-$)		
3515.1?[‡] 13	(27/2$^+$)		
3699.2?[‡] 11	(27/2$^+$)		
3700.1?[‡] 15	(27/2$^-$)		
4063.5?[‡] 17	(25/2$^-$)		
4127.7?[‡] 12	(29/2$^+$)		
4260.3?[‡] 16	(31/2$^+$)		
4486.0?[‡#] 12	(31/2$^+$)		

[†] From Adopted Levels.

[‡] Level added (by evaluators) based on a similar level reported in (^{18}O,5nγ) and on the observation of similar energy γ rays in (^{16}O,3nγ) (1974Gi01), although, the branching ratios differ, in some cases, from those in (^{18}O,5nγ).

[#] γ-ray branching ratios disagree with those from (^{18}O,5nγ).

$^{122}\text{Sn}(^{16}\text{O},3n\gamma)$ **1974Gi01 (continued)**

$\gamma(^{135}\text{Ce})$

For A_2's listed here, an attenuation coefficient of 0.79 *19* should be used to determine $A_2(\text{max})$ (1974Gi01).

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[d]	Comments
82.64 *7*	>35	82.6	$3/2^{(+)}$	0.0	$1/2^{(+)}$	M1+E2[#]	<0.4	2.19 *15*	α(K)=1.77 *4*; α(L)=0.33 *9*; α(M)=0.071 *21*; α(N+..)=0.018 *5* α(N)=0.015 *5*; α(O)=0.0024 *6*; α(P)=0.000133 *3* E_γ: from adopted gammas. I_γ: from intensity balance.
^{x}103.3^b *2*	3.0 *6*								
109.5 *2*	1.2 *3*	1145.1	$(15/2^-)$	1035.6	$(13/2^-)$				
^{x}125.0^b *2*	2.5 *6*								
149.7 *2*	25 *3*	445.7	$(11/2^-)$	296.0	$(5/2^+)$	E3[#]		3.73	α(K)=1.515 *23*; α(L)=1.72 *3*; α(M)=0.396 *7*; α(N+..)=0.0970 *16* α(N)=0.0851 *14*; α(O)=0.01182 *19*; α(P)=8.39×10^{-5} *13* A_2=−0.02 *6*.
^{x}159.6^b *2*	54 *6*								
^{x}169.6^b *2*	8.4 *10*								
175.0^a *2*	4.8 *9*	3229.2?	$(23/2^+)$	3054.1?	$(21/2^+)$	D+Q[&]			A_2=−0.44 *9*.
181.9 *3*	0.8 *2*	2051.5	$(19/2^-)$	1869.6	$(17/2^-)$				
^{x}189.4^b *2*	8.9 *10*								
202.1^a *2*	11.1 *12*	3431.3?	$(25/2^+)$	3229.2?	$(23/2^+)$	D+Q[&]			A_2=−0.38 *8*.
^{x}206.9^b *2*	6.4 *9*								
213.4 *2*	100 *10*	296.0	$(5/2^+)$	82.6	$3/2^{(+)}$	M1[#]		0.1430	α(K)=0.1222 *18*; α(L)=0.01646 *24*; α(M)=0.00344 *5*; α(N+..)=0.000897 *13* α(N)=0.000764 *11*; α(O)=0.0001238 *18*; α(P)=9.41×10^{-6} *14* A_2=+0.04 *1*.
^{x}238.1^b *3*	2.0 *6*								
^{x}248.9^c *3*	2.1 *6*								
256.0 *3*	30 *3*	2125.6	$(19/2^+)$	1869.6	$(17/2^-)$	D[&]			A_2=−0.26 *8*.
^{x}262.2^b *3*	3.7 *8*								
267.9^a *4*	4.8 *9*	3699.2?	$(27/2^+)$	3431.3?	$(25/2^+)$	D+Q[&]			A_2=−0.46 *9*.
^{x}277.0^c *4*	3.5 *6*								
^{x}285.0^b *4*	2.0 *6*								
296.1 *3*	25 *3*	296.0	$(5/2^+)$	0.0	$1/2^{(+)}$	E2[#]		0.0508	α(K)=0.0407 *6*; α(L)=0.00792 *12*; α(M)=0.001705 *25*; α(N+..)=0.000431 *7* α(N)=0.000372 *6*; α(O)=5.64×10^{-5} *9*; α(P)=2.68×10^{-6} *4* A_2=−0.04 *8*.
^{x}309.0^{‡b} *4*	5.3 *10*								
^{x}325.4^b *4*	4.6 *10*								
^{x}334.8^b *4*	3.0 *6*								

^{122}Sn(^{16}O,3nγ)   **1974Gi01** (continued)

γ(^{135}Ce) (continued)

E_γ	$I_\gamma^\dagger$	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
358.3^a 4	3.4 7	4486.0?	(31/2$^+$)	4127.7?	(29/2$^+$)	D+Q$^\&$	A$_2$=−0.42 *11*.
^{x}376.0^c 4	3.3 7						
379.4^a 4	10.4 *11*	2249.3?	(19/2$^-$)	1869.6	(17/2$^-$)		
^{x}381.6^b 4	5.8 9						
^{x}384.5^b 4	8.4 *10*						
^{x}391.8^c 4	7.0 *10*						
^{x}404.0^b 4	5.4 *10*						
^{x}417.2^b 4	7.9 *10*						
^{x}423.0^b 4	4.8 9						
425.6 4	26 *3*	2551.0	(23/2$^+$)	2125.6	(19/2$^+$)	(Q)$^@$	A$_2$=+0.28 *16*.
428.5^a 5	4.4 9	4127.7?	(29/2$^+$)	3699.2?	(27/2$^+$)		
433.4^a 5	7.7 *10*	2682.7?	(21/2$^-$)	2249.3?	(19/2$^-$)	D+Q$^\&$	A$_2$=−0.63 *6*.
^{x}440.0^c 5	4.4 9						
^{x}446.8^b 6	3.5 7						
^{x}451.9^b 5	6.8 9						
^{x}464.7^b 5	11.7 *12*						
^{x}498.6^c 5	4.0 8						
^{x}521.5^b 6	4.3 8						
^{x}533.3^b 6	7.4 *10*						
557.0^a 6	14.7 *15*	3503.2?	(25/2$^-$)	2946.2?	(23/2$^-$)		
^{x}569.7$^{\ddagger b}$ 6	15.5 *16*						
^{x}577.9^b 6	5.4 9						
580.1^a 6	14.9 *15*	2249.3?	(19/2$^-$)	1669.9	(15/2$^-$)		
^{x}584.4^c 7	3.0 6						
589.7 6	47 *5*	1035.6	(13/2$^-$)	445.7	(11/2$^-$)	D+Q$^\&$	A$_2$=−0.71 *4*.
^{x}595.5^b 6	6.8 9						
^{x}603.8^b 6	26 *3*						
^{x}616.0^b 7	6.1 9						
^{x}620.8^b 8	4.3 8						
^{x}628.0^c 7	6.3 9						
635.2 7	17.6 *18*	1669.9	(15/2$^-$)	1035.6	(13/2$^-$)	D(+Q)$^\&$	A$_2$=−0.30 *10*.
^{x}647.0^b 7	12.2 *13*						
^{x}665.2$^{\ddagger b}$ 8	5.0 *10*						
^{x}668.3^b 7	10.9 *11*						
678.9^a 7	15.1 *15*	3229.2?	(23/2$^+$)	2551.0	(23/2$^+$)		
699.6 7	74 *8*	1145.1	(15/2$^-$)	445.7	(11/2$^-$)	(Q)$^@$	A$_2$=+0.35 *11*.
724.3 7	37 *4*	1869.6	(17/2$^-$)	1145.1	(15/2$^-$)	D+Q$^\&$	A$_2$=−0.79 *3*.
^{x}734.9^b 9	2.6 6						
^{x}741.5^b 8	4.5 9						
745.2^a 8	6.6 *10*	4260.3?	(31/2$^+$)	3515.1?	(27/2$^+$)		
753.9$^{\ddagger a}$ 8	4.8 *10*	3700.1?	(27/2$^-$)	2946.2?	(23/2$^-$)		
^{x}770.1^b 8	6.7 *10*						
^{x}783.3^b 8	8.0 *10*						
786.9^a 8	6.0 *10*	4486.0?	(31/2$^+$)	3699.2?	(27/2$^+$)		
^{x}827.7^b 10	3.4 7						
833.1 9	16.3 *17*	1869.6	(17/2$^-$)	1035.6	(13/2$^-$)	(Q)$^@$	A$_2$=+0.31 *13*.

^{122}Sn(^{16}O,3nγ)   1974Gi01 (continued)

γ(^{135}Ce) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
^{x}862.7^c 10	3.9 8						
^{x}875.4^c 10	3.5 7						
^{x}885.4^b 10	5.7 9						
^{x}888.2^b 10	5.1 10						
894.7^a 10	4.2 8	2946.2?	(23/2⁻)	2051.5	(19/2⁻)		
^{x}897.6^b 10	3.2 6						
906.2‡ 9	21 2	2051.5	(19/2⁻)	1145.1	(15/2⁻)	(Q)	A$_2$=+0.30 18.
927.3^a 9	8.9 10	3054.1?	(21/2⁺)	2125.6	(19/2⁺)		
^{x}940.3^c 12	2.6 5						
960.0^a 10	4.2 8	4063.5?	(25/2⁻)	3103.5?	(23/2⁻)		
964.1‡^{a} 10	21 3	3515.1?	(27/2⁺)	2551.0	(23/2⁺)		
^{x}977.7^c 10	6.3 9						
^{x}1000.5^b 10	9.2 12						
^{x}1004.9^b 12	3.3 7						
^{x}1012.7‡^{c} 12	4.7 9						
1019.0^a 11	5.3 9	2888.6?	(21/2⁻)	1869.6	(17/2⁻)		
^{x}1029.3‡^{b} 11	7.1 10						
1052.0^a 11	9.5 10	3103.5?	(23/2⁻)	2051.5	(19/2⁻)		
^{x}1197.4^b 13	5.5 9						
^{x}1368.7^b 14	25 3						

[†] Relative Iγ for E(^{16}O)=62 MeV at 55° to the beam.

‡ Composite line.

From adopted gammas.

@ $\gamma(\theta)$ consistent with ΔJ=2, quadrupole.

& $\gamma(\theta)$ consistent with ΔJ=1, D+Q or D(+Q).

^{a} This γ ray matches in energy to that reported in ^{122}Sn(^{18}O,5nγ) (1990Ma26). Placement is adopted from (^{18}O,5nγ). It is noted, however, that the branching ratios in some cases disagree with those from (^{16}O,5nγ).

^{b} γ ray not reported in ^{122}Sn(^{18}O,5nγ).

^{c} This γ ray matches in energy to that reported in ^{122}Sn(^{18}O,5nγ) but placement as suggested in (^{18}O,5nγ) does not seem valid in the level scheme from (^{16}O,3nγ).

^{d} 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.
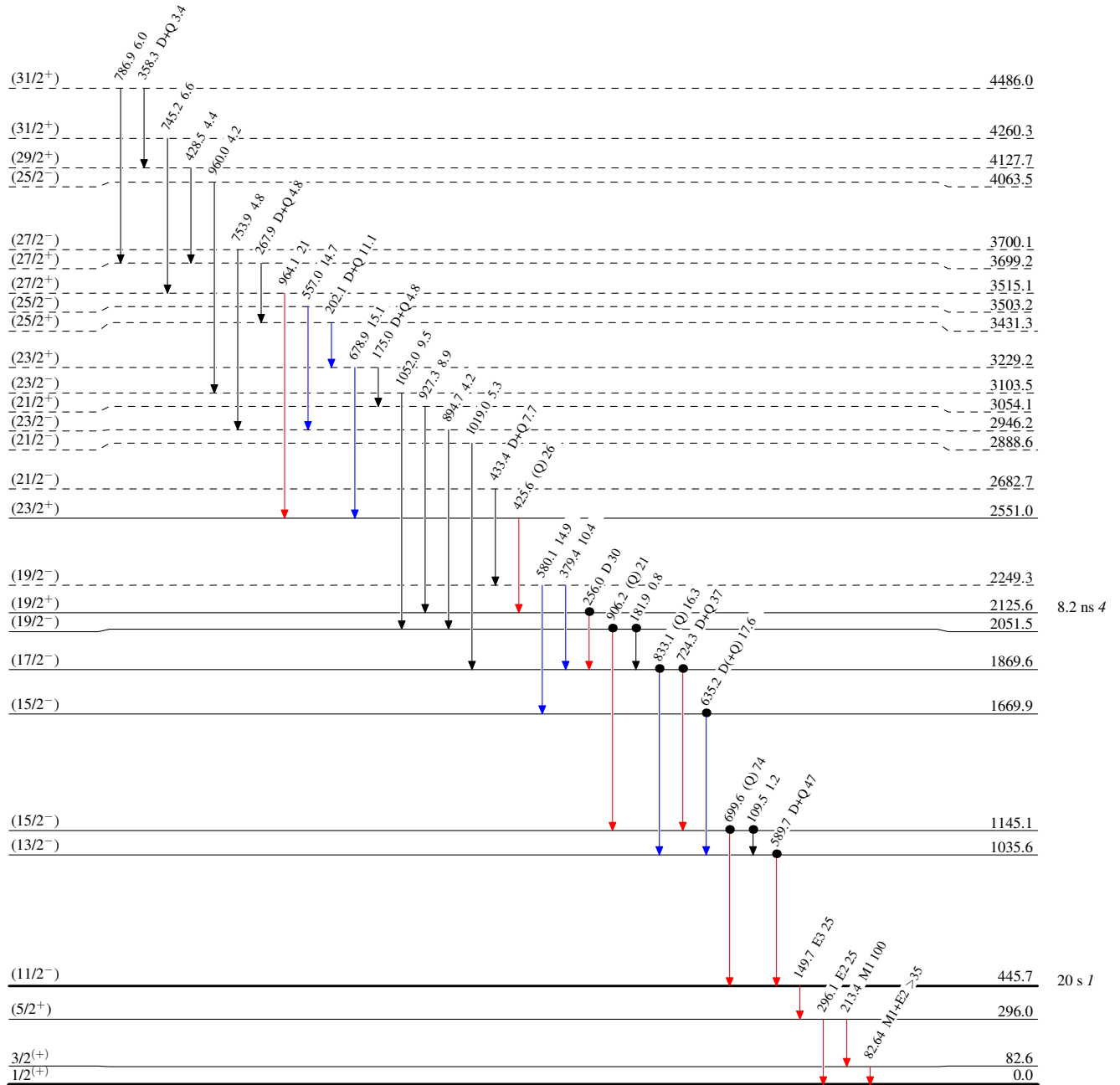
^{x} γ ray not placed in level scheme.

^{122}Sn(^{16}O,3nγ)   1974Gi01   Legend

Level Scheme

Intensities: Relative I$_\gamma$

I$_\gamma$ < 2%×I$_\gamma^{max}$
I$_\gamma$ < 10%×I$_\gamma^{max}$
I$_\gamma$ > 10%×I$_\gamma^{max}$
● Coincidence

786.9 6.0
358.3 D+Q 3.4
745.2 6.6
428.5 4.4
960.0 4.2
753.9 4.8
267.9 D+Q 4.8
964.1 21
557.0 14.7
202.1 D+Q 11.1
678.9 15.1
175.0 D+Q 4.8
1052.0 9.5
927.3 8.9
894.7 4.2
1019.0 5.3
433.4 D+Q 7.7
425.6 (Q) 26
580.1 14.9
379.4 10.4
256.0 D 30
906.2 (Q) 21
181.9 0.8
833.1 (Q) 16.3
724.3 D+Q 37
635.2 D+(Q) 17.6
699.6 (Q) 74
109.5 1.2
589.7 D+Q 47
149.7 E3 25
296.1 E2 25
213.4 M1 100
82.64 M1+E2 >35

(31/2$^+$)   4486.0
(31/2$^+$)   4260.3
(29/2$^+$)   4127.7
(25/2$^-$)   4063.5
(27/2$^-$)   3700.1
(27/2$^+$)   3699.2
(27/2$^+$)   3515.1
(25/2$^-$)   3503.2
(25/2$^+$)   3431.3
(23/2$^+$)   3229.2
(23/2$^-$)   3103.5
(21/2$^+$)   3054.1
(23/2$^-$)   2946.2
(21/2$^-$)   2888.6
(21/2$^-$)   2682.7
(23/2$^+$)   2551.0
(19/2$^-$)   2249.3
(19/2$^+$)   2125.6   8.2 ns 4
(19/2$^-$)   2051.5
(17/2$^-$)   1869.6
(15/2$^-$)   1669.9
(15/2$^-$)   1145.1
(13/2$^-$)   1035.6
(11/2$^-$)   445.7   20 s 1
(5/2$^+$)   296.0
3/2$^{(+)}$ 82.6
1/2$^{(+)}$ 0.0

$^{135}_{58}$Ce$_{77}$