^{122}Sn(^{32}S,5nγ) 1996Gu17

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 185, 2 (2022)	23-Aug-2022

1996Gu17: E=163 MeV ^{32}S beam was produced at the Nuclear Science Centre, New Delhi. Target was 1.4 mg/cm^2 enriched tin on a 25 mg/cm^2 lead backing. γ rays were detected with the Gamma Detector Array (GDA) consisting of 7 n-type Compton-suppressed HPGe detectors with a 14-element BGO multiplicity filter. Measured Eγ, Iγ, $\gamma\gamma(\theta)$(DCO). Deduced levels, J^π, configurations, γ-ray multipolarities. Comparisons with shell-model calculations.

Other:

2000Ap01: ^{120}Sn(^{34}S,5nγ). Measured $\gamma\gamma$, search for SD structures.

1983Wa07: report data on continuous γ-ray spectra (average energy, multiplicity and multipolarity), $\gamma(\theta)$, $\gamma\gamma$ for transitions feeding the high-spin isomer at 7410.

Possible SD structure exists in ^{149}Dy as deduced (2000Ap01) from a weak continuum (with a total SD intensity of 1.8% *5*) in a ridge in the $\gamma\gamma$ coin matrix in ^{120}Sn(^{34}S,5nγ) reaction. However, no discrete SD band structures have been found in this experiment; with an upper limit of population of 0.9% relative to the intensity of the relevant reaction channel.

^{149}Dy Levels

E(level)[†]	J^π[@]	$T_{1/2}$[a]	Comments
0.0	7/2$^-$		
1073.0 *3*	13/2$^+$	12.5 ns *15*	
1584.0 *3*	(11/2$^-$)		
2251.8 *5*	17/2$^+$		
2550.8 *6*	21/2$^+$		
2661.8 *6*	27/2$^-$	0.490 s *15*	
3646.7 *7*	29/2$^+$		
3886.5 *8*	31/2$^+$		
4086.1 *8*	33/2$^+$		
5224.3 *8*	35/2$^+$		
5479.5 *8*	37/2$^+$		
5749.5 *8*	39/2$^+$		
6179.6 *8*	41/2$^+$		
6330.4 *9*			
6680.0 *9*			
6893.4 *9*			
6921.4? *9*	41/2$^+$		
7158.8 *9*			
7243.7 *9*			J^π: 41/2$^+$ given for 1064.1γ in Table I of 1996Gu17.
7412.2 *9*	43/2$^+$		
7412.2+x[‡]	(45/2$^-$)	28 ns *2*	E(level): x assumed as 80 (1996Gu17); but in 2002Go06 two tentative cascades have been proposed, defining the isomer at 8520 (see the Adopted Levels), implying x=1108. J^π: (49/2$^+$) in the Adopted Levels.
8007.6+x[‡]	(47/2)[&]		J^π: negative parity given in Table 1 of 1996Gu17.
8301.9+x[‡]	(49/2)[&]		
8674.9+x[‡]	(49/2)[&]		
9131.3+x[‡]	(51/2)[&]		
9835.4+x[#]			
9881.7+x[#]	(53/2)[&]		
10139.8+x[#]			
10485.8+x[#]	(53/2)[&]		
10683.6+x[#]	(55/2)[&]		
10742.8+x[#]			
11018.7+x[#]	(57/2)[&]		

Continued on next page (footnotes at end of table)

^{122}Sn(^{32}S,5nγ) 1996Gu17 (continued)

^{149}Dy Levels (continued)

E(level)[†]	J$^\pi$[@]	Comments
11045.9+x[#]		
12162.3+x?[#]	(61/2)	E(level): this level is not included in the Adopted Levels, as the level proposed by 1996Gu17 from the placement of 1143.6γ, which has been placed from the 6893 level by 2002Go06 in (^{16}O,p7nγ), with the latter being adopted.

[†] From a least-squares fit to γ-ray energies, assuming $\Delta E\gamma$=0.3 keV.
[‡] Value of x=1108 gives a corresponding level in the Adopted Levels.
[#] Additional 962 keV should be added above 9131+x level to get a corresponding level in the Adopted Levels; 2002Go06 in ^{141}Pr(^{16}O,p7nγ) report an intermediate 962.1γ connecting 9131.3+x level and all levels above.
[@] Proposed by 1996Gu17 based on $\gamma\gamma(\theta)$(DCO) data with the underlying assumption that spin increases monotonically with excitation energy along the most intense pathways. Most listed values, except as indicated, are the same as in the Adopted Levels with the difference that many are placed in parentheses there due to lack of strong arguments.
[&] For corresponding levels in the Adopted Levels, J^π values are higher by 2 units of spin.
[a] From the Adopted Levels.

γ(^{149}Dy)

DCO ratios are expected to be $0.8 \le R_{DCO} \le 1.20$ with the lower limit for the mixed E2-M1 transitions, the upper limit for the possible $\Delta J=0$ transitions, and a typical value of 1.0 for a pure dipole; $R_{DCO} \approx 0.6$ for a stretched quadrupole transition (1996Gu17). However, in Table I of 1996Gu17, some transitions have inconsistent R_{DCO} ratios and ΔJ values, according to the authors' statement above. No multipolarities are given by 1996Gu17 and none have been deduced by the evaluators from R_{DCO}, as no gating transitions were stated by 1996Gu17.

E$_\gamma$[†]	I$_\gamma$[†]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
x		7412.2+x	(45/2$^-$)	7412.2	43/2$^+$	
111.0		2661.8	27/2$^-$	2550.8	21/2$^+$	Mult=E3 in Adopted Gammas. E$_\gamma$: 110.9 in Fig. 1 of 1996Gu17.
168.1	3.4 *3*	7412.2	43/2$^+$	7243.7		DCO=1.00 *6*
197.7	3.5 *4*	10683.6+x	(55/2)	10485.8+x	(53/2)	DCO=0.84 *7*
199.6	33.0 *20*	4086.1	33/2$^+$	3886.5	31/2$^+$	DCO=1.08 *4*
213.0		6893.4		6680.0		
239.8	78 *5*	3886.5	31/2$^+$	3646.7	29/2$^+$	DCO=0.98 *3*
253.3	5.0 *10*	7412.2	43/2$^+$	7158.8		DCO=0.84 *8*
254.9	21.0 *20*	5479.5	37/2$^+$	5224.3	35/2$^+$	DCO=0.95 *4*
269.8	45 *3*	5749.5	39/2$^+$	5479.5	37/2$^+$	DCO=0.94 *2*
294.2	8.0 *10*	8301.9+x	(49/2)	8007.6+x	(47/2)	DCO=0.92 *7*
299.0		2550.8	21/2$^+$	2251.8	17/2$^+$	
303.1	5.0 *10*	11045.9+x		10742.8+x		DCO=0.88 *12*
335.1	17.0 *10*	11018.7+x	(57/2)	10683.6+x	(55/2)	DCO=0.86 *5*
350.0	1.9 *4*	7243.7		6893.4		E$_\gamma$: 350.3 in Fig. 1 1 of 1996Gu17.
430.3	44 *3*	6179.6	41/2$^+$	5749.5	39/2$^+$	DCO=0.99 *4*
456.5	8.0 *10*	9131.3+x	(51/2)	8674.9+x	(49/2)	DCO=0.66 *11*
479.2	4.0 *10*	7158.8		6680.0		DCO=1.08 *13*
491.1	33.0 *20*	7412.2	43/2$^+$	6921.4?	41/2$^+$	DCO=1.00 *4*
525.4	13.0 *10*	5749.5	39/2$^+$	5224.3	35/2$^+$	DCO=0.94 *11*
543.7	4.0 *10*	10683.6+x	(55/2)	10139.8+x		DCO=1.67 *21*
580.8	3.0 *10*	6330.4		5749.5	39/2$^+$	
595.4	28.0 *20*	8007.6+x	(47/2)	7412.2+x	(45/2$^-$)	DCO=1.17 *5*

Continued on next page (footnotes at end of table)

^{122}Sn(^{32}S,5nγ) 1996Gu17 (continued)

$\gamma(^{149}Dy)$ (continued)

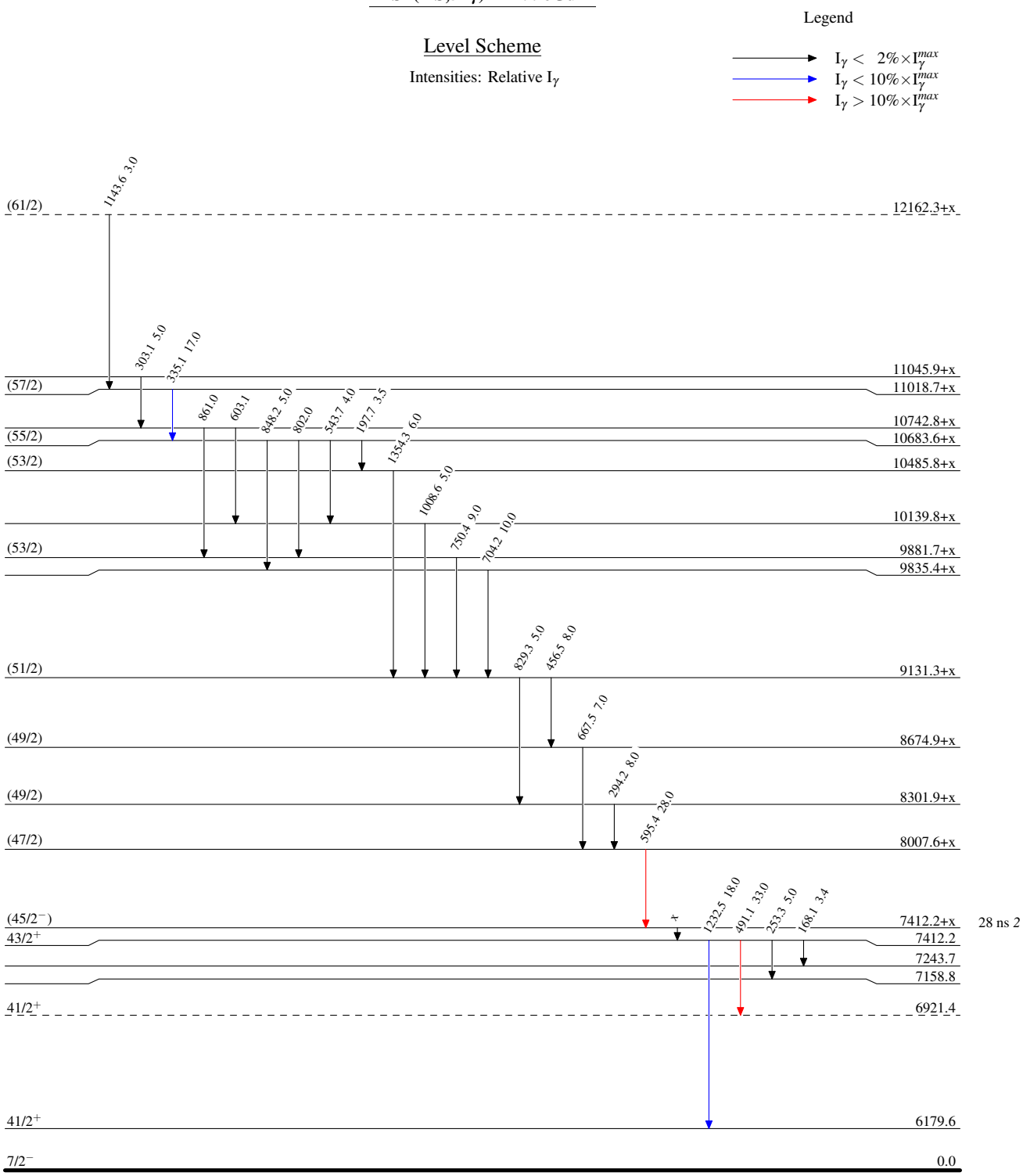
E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Comments
603.1		10742.8+x		10139.8+x		E_γ: 602.8 in Fig. 1 of 1996Gu17.
667.5	7.0 *10*	8674.9+x	(49/2)	8007.6+x	(47/2)	DCO=1.16 *15*
700.3	10.0 *20*	6179.6	$41/2^+$	5479.5	$37/2^+$	DCO=1.06 *9*
704.2	10.0 *10*	9835.4+x		9131.3+x	(51/2)	DCO=1.19 *8*
742.1	23.2 *20*	6921.4?	$41/2^+$	6179.6	$41/2^+$	DCO=1.20 *5*
750.4	9.0 *10*	9881.7+x	(53/2)	9131.3+x	(51/2)	DCO=1.28 *14*
802.0		10683.6+x	(55/2)	9881.7+x	(53/2)	
829.3	5.0 *10*	9131.3+x	(51/2)	8301.9+x	(49/2)	DCO=1.60 *24*
848.2	5.0 *10*	10683.6+x	(55/2)	9835.4+x		
861.0		10742.8+x		9881.7+x	(53/2)	
930.5	3.0 *10*	6680.0		5749.5	$39/2^+$	DCO=1.2 *3*
984.9	100.0 *20*	3646.7	$29/2^+$	2661.8	$27/2^-$	DCO=0.96 *3*
1008.6	5.0 *10*	10139.8+x		9131.3+x	(51/2)	DCO=1.07 *17*
1064.1	6.0 *10*	7243.7		6179.6	$41/2^+$	DCO=0.7 *3*
1073.0		1073.0	$13/2^+$	0.0	$7/2^-$	Mult=E3 in Adopted Gammas.
1138.2	15.0 *20*	5224.3	$35/2^+$	4086.1	$33/2^+$	DCO=0.89 *9*
1143.6	3.0 *10*	12162.3+x?	(61/2)	11018.7+x	(57/2)	DCO=1.5 *4* E_γ: placed from the 6893 level by 2002Go06 in (^{16}O,p7nγ), which is recommended in the Adopted Levels, Gammas dataset.
1178.8		2251.8	$17/2^+$	1073.0	$13/2^+$	
1232.5	18.0 *20*	7412.2	$43/2^+$	6179.6	$41/2^+$	DCO=1.18 *7*
1337.7	45 *3*	5224.3	$35/2^+$	3886.5	$31/2^+$	DCO=0.89 *6*
1354.3	6.0 *20*	10485.8+x	(53/2)	9131.3+x	(51/2)	DCO=0.9 *3* E_γ: 1353.3 in Table I of 1996Gu17.
1393.5	41 *3*	5479.5	$37/2^+$	4086.1	$33/2^+$	DCO=1.80 *6*
1408.9	0.7 *2*	7158.8		5749.5	$39/2^+$	
1584.0		1584.0	$(11/2^-)$	0.0	$7/2^-$	

† From 1996Gu17.

^{122}Sn(^{32}S,5nγ) 1996Gu17

Level Scheme

Intensities: Relative I_γ



$^{149}_{66}Dy_{83}$

^{122}Sn(^{32}S,5nγ) 1996Gu17

Level Scheme (continued)

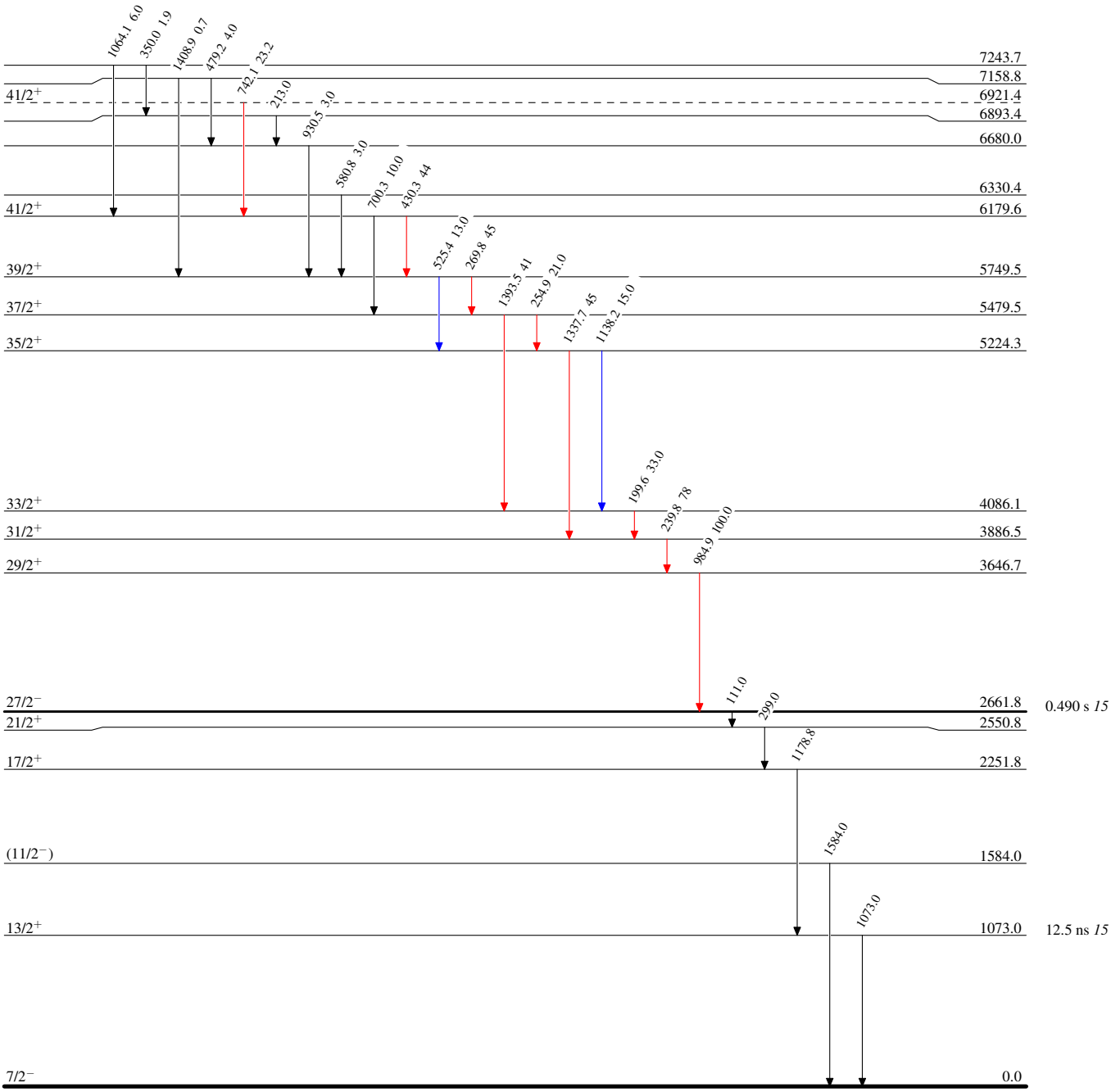
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



$^{149}_{66}Dy_{83}$