^{154}Sm(^{17}O,4nγ),(^{18}O,5nγ) 1982Ro08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 191,1 (2023)	22-Aug-2023

1982Ro08: ^{154}Sm(^{17}O,4nγ),E(^{17}O)=80 MeV; ^{154}Sm(^{18}O,5nγ),E(^{18}O)=84 MeV. Metallic >98% enriched ^{154}Sm targets. Measured Eγ, Iγ, $\gamma(\theta)$ at nine angles, $\gamma\gamma$-coin using Ge(Li), Compton-suppressed Ge(Li), and a large-volume NaI(Tl) detectors at the Niels Bohr Institute Tandem Accelerator facility. Comparison with cranked shell-model calculations.

Other:

1977Ri13: ^{152,154}Sm(^{16}O,xnγ e$^-$),(^{18}O,xnγ e$^-$), E=85-95 MeV: Measured conversion electrons using recoil shadow method with a solenoid transport system and a Si(Li) detector at MPI Nuclear Physics, Heidelberg MP Tandem accelerator facility. The paper is focused on study of comparative behavior of backbending in $i_{13/2}$ and 5/2[523] bands in ^{163}Yb, ^{165}Yb and ^{167}Yb. Authors state that the $i_{13/2}$ band was observed up to 41/2$^+$ and 5/2[523] band up to 33/2$^-$ in ^{167}Yb. No spectroscopic data are available for ^{167}Yb.

All data are from 1982Ro08, unless otherwise indicated.

^{167}Yb Levels

E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡
0.0#	5/2$^-$	407.92@ 23	17/2$^+$	1601.3@ 4	29/2$^+$	3398.7@ 5	41/2$^+$
29.66@ 1	5/2$^+$	442.4# 3	13/2$^-$	1656.6# 4	25/2$^-$	3531.6& 15	39/2$^+$
33.91& 1	7/2$^+$	644.43& 24	19/2$^+$	2148.3@ 4	33/2$^+$	3836.7# 15	41/2$^-$
58.540@ 12	9/2$^+$	721.4@ 3	21/2$^+$	2158.4# 4	29/2$^-$	4091.0@ 12	45/2$^+$
78.7 4	7/2$^-$	783.6# 3	17/2$^-$	2158.6& 4	31/2$^+$	4291.6& 18	43/2$^+$
125.86& 20	11/2$^+$	1060.8& 3	23/2$^+$	2683.7# 5	33/2$^-$	4496.7# 18	45/2$^-$
178.80# 23	9/2$^-$	1121.9@ 3	25/2$^+$	2751.1@ 5	37/2$^+$	4833.0@ 15	49/2$^+$
186.01@ 17	13/2$^+$	1192.7# 4	21/2$^-$	2816.6& 11	35/2$^+$	5212.7# 21	49/2$^-$
330.24& 21	15/2$^+$	1569.7& 4	27/2$^+$	3236.7# 11	37/2$^-$	5634.0@ 18	53/2$^+$

† From a least-squares fit to Eγ data.

‡ From 1982Ro08; based on multipolarities of transitions and fits of cascades of coincident γ rays into rotational bands.

Band(A): ν5/2[523].

@ Band(B): ν5/2[642],α=+1/2.

& Band(b): ν5/2[642],α=−1/2.

γ(^{167}Yb)

E$_\gamma$†	I$_\gamma$#	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.^{b}	α^c	Comments
(24.63‡ 1)		58.540	9/2$^+$	33.91	7/2$^+$			
(28.88‡ 1)		58.540	9/2$^+$	29.66	5/2$^+$			
29.66‡ 1		29.66	5/2$^+$	0.0	5/2$^-$			
33.91‡ 1		33.91	7/2$^+$	0.0	5/2$^-$			
60.1 2	36.0 36	186.01	13/2$^+$	125.86	11/2$^+$	[M1]	2.44 5	I$_\gamma$: obtained by 1982Ro08 from intensity balance at 186 level, assuming that the 60γ is pure M1. For E2, evaluators estimate Iγ≥4.9 based on I(γ+ce)(60γ)≥117 18 and α(E2)=24.8.
61.1 5		1121.9	25/2$^+$	1060.8	23/2$^+$			
67.4 5		125.86	11/2$^+$	58.540	9/2$^+$			
76.9 5		721.4	21/2$^+$	644.43	19/2$^+$			
77.7 5	15.0@ 23	407.92	17/2$^+$	330.24	15/2$^+$			

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^{154}Sm(^{17}O,4nγ),(^{18}O,5nγ) 1982Ro08 (continued)

γ(^{167}Yb) (continued)

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[b]	Comments
78.6 5		78.7	7/2−	0.0	5/2−		
91.9 5		125.86	11/2+	33.91	7/2+		
100.1 5		178.80	9/2−	78.7	7/2−		
120.2 5	5.5 11	178.80	9/2−	58.540	9/2+		A_2=+0.04 17; A_4=−0.09 19
127.5 2	41.3 41	186.01	13/2+	58.540	9/2+	Q	A_2=+0.25 3; A_4=−0.06 3
144.2 2	45.8 46	330.24	15/2+	186.01	13/2+	D+Q	A_2=−0.78 3; A_4=+0.14 7
144.9 5	8.0[@] 16	178.80	9/2−	33.91	7/2+		
178.7 5	7.8 16	178.80	9/2−	0.0	5/2−		A_2=+0.09 6; A_4=−0.01 7
204.4 2	76.0 76	330.24	15/2+	125.86	11/2+	Q	A_2=+0.27 3; A_4=−0.05 4
221.9 2	100.0	407.92	17/2+	186.01	13/2+	Q	A_2=+0.28 3; A_4=−0.06 4
236.5 2	28.6 29	644.43	19/2+	407.92	17/2+	D+Q	A_2=−0.72 3; A_4=−0.01 3
263.5 3	15.2 23	442.4	13/2−	178.80	9/2−	Q	A_2=+0.21 2; A_4=−0.03 2
313.5 2	176 18	721.4	21/2+	407.92	17/2+	(Q)	A_2=+0.47 16; A_4=−0.18 16
314.2 2	53.3 53	644.43	19/2+	330.24	15/2+	(Q)	A_2=+0.23 11; A_4=−0.13 12
316.6 3	14.7[&] 22	442.4	13/2−	125.86	11/2+	D+Q	A_2=+0.41 5; A_4=+0.10 5
339.4 3	13.0 20	1060.8	23/2+	721.4	21/2+	D+Q	A_2=−0.65 3; A_4=−0.08 4 Negative A_4 is inconsistent with ΔJ=1 transition.
341.2 2	23.2 23	783.6	17/2−	442.4	13/2−	Q	A_2=+0.26 2; A_4=−0.09 2
400.5 2	152 15	1121.9	25/2+	721.4	21/2+	Q	A_2=+0.28 4; A_4=−0.07 5
409.1 2	33.0 33	1192.7	21/2−	783.6	17/2−	Q	A_2=+0.33 3; A_4=−0.06 3
416.4 2	61.6 62	1060.8	23/2+	644.43	19/2+	Q	A_2=+0.24 3; A_4=−0.04 3
447.8 5	7.3 15	1569.7	27/2+	1121.9	25/2+	D+Q	A_2=−0.52 5; A_4=+0.13 6
453 1	12.0[@] 18	783.6	17/2−	330.24	15/2+		
463.9 2	34.3 34	1656.6	25/2−	1192.7	21/2−	(Q)	A_2=+0.25 3; A_4=−0.03 4
479.4 2	128 13	1601.3	29/2+	1121.9	25/2+	Q	A_2=+0.26 4; A_4=−0.06 4
501.8 2	33.1 33	2158.4	29/2−	1656.6	25/2−	Q	A_2=+0.22 2; A_4=−0.10 3
508.9 2	66.0 66	1569.7	27/2+	1060.8	23/2+	Q	A_2=+0.20 3; A_4=−0.05 4
525 1	[a]	2683.7	33/2−	2158.6	31/2+		
525.3 2	34.4 34	2683.7	33/2−	2158.4	29/2−	Q	A_2=+0.18 3; A_4=−0.07 3
547.0 2	103 10	2148.3	33/2+	1601.3	29/2+	Q	A_2=+0.26 5; A_4=−0.08 5
548 1	4.0[@] 8	1192.7	21/2−	644.43	19/2+		
553 1	52.4[&] 52	3236.7	37/2−	2683.7	33/2−	Q	A_2=+0.48 7; A_4=−0.19 7
557.4 5	[a]	2158.6	31/2+	1601.3	29/2+		
588.9 2	42.5[&] 43	2158.6	31/2+	1569.7	27/2+	(Q)	A_2=+0.17 2; A_4=−0.02 2
589 1	[a]	2158.4	29/2−	1569.7	27/2+		
596 1	[a]	1656.6	25/2−	1060.8	23/2+		
600 1	22.7 23	3836.7	41/2−	3236.7	37/2−	(Q)	A_2=+0.22 6; A_4=−0.07 7
602.8 2	77.5[&] 78	2751.1	37/2+	2148.3	33/2+	Q	A_2=+0.19 2; A_4=−0.05 3
647.6 2	34.0[&] 34	3398.7	41/2+	2751.1	37/2+		A_2=+0.08 2; A_4=+0.06 3
658 1	24.0 24	2816.6	35/2+	2158.6	31/2+		A_2=+0.13 4; A_4=+0.06 5
660 1	[a]	4496.7	45/2−	3836.7	41/2−		
692.3 10		4091.0	45/2+	3398.7	41/2+		I_γ: not available due to large interference from background.
715 1	[a]	3531.6	39/2+	2816.6	35/2+		
716 1	[a]	5212.7	49/2−	4496.7	45/2−		
742 1		4833.0	49/2+	4091.0	45/2+		
760 1	[a]	4291.6	43/2+	3531.6	39/2+		
801 1		5634.0	53/2+	4833.0	49/2+		

[†] Energy uncertainties are stated by 1982Ro08 as <0.2 keV for Iγ≥20, up to 0.5 keV for weaker lines. Evaluators assign 0.2 keV for γ rays with Iγ≥20, 0.3 keV for γ rays with Iγ=10-19.9, 0.5 keV for for γ rays with Iγ<10 or when Iγ value is not

Continued on next page (footnotes at end of table)

^{154}Sm(^{17}O,4nγ),(^{18}O,5nγ) 1982Ro08 (continued)

γ(^{167}Yb) (continued)

available, and 1 keV when Eγ stated to nearest keV in Table 2 of 1982Ro08.

‡ From the Adopted Gammas.

Relative intensities are from ^{154}Sm(^{18}O,5nγ),E(^{18}O)=84 MeV reaction, and are average of the 30° and 90° projected spectra. Uncertainties are stated by 1982Ro08 as 10% for Iγ≥20, and up to 20% for weaker gammas. Evaluators assign 10% for Iγ≥20, 15% for Iγ=10-19.9 and 20% for Iγ<10.

@ From coincidence data; not corrected for possible angular correlation effects.

& Includes contribution from contaminant lines.

[a] Weak.

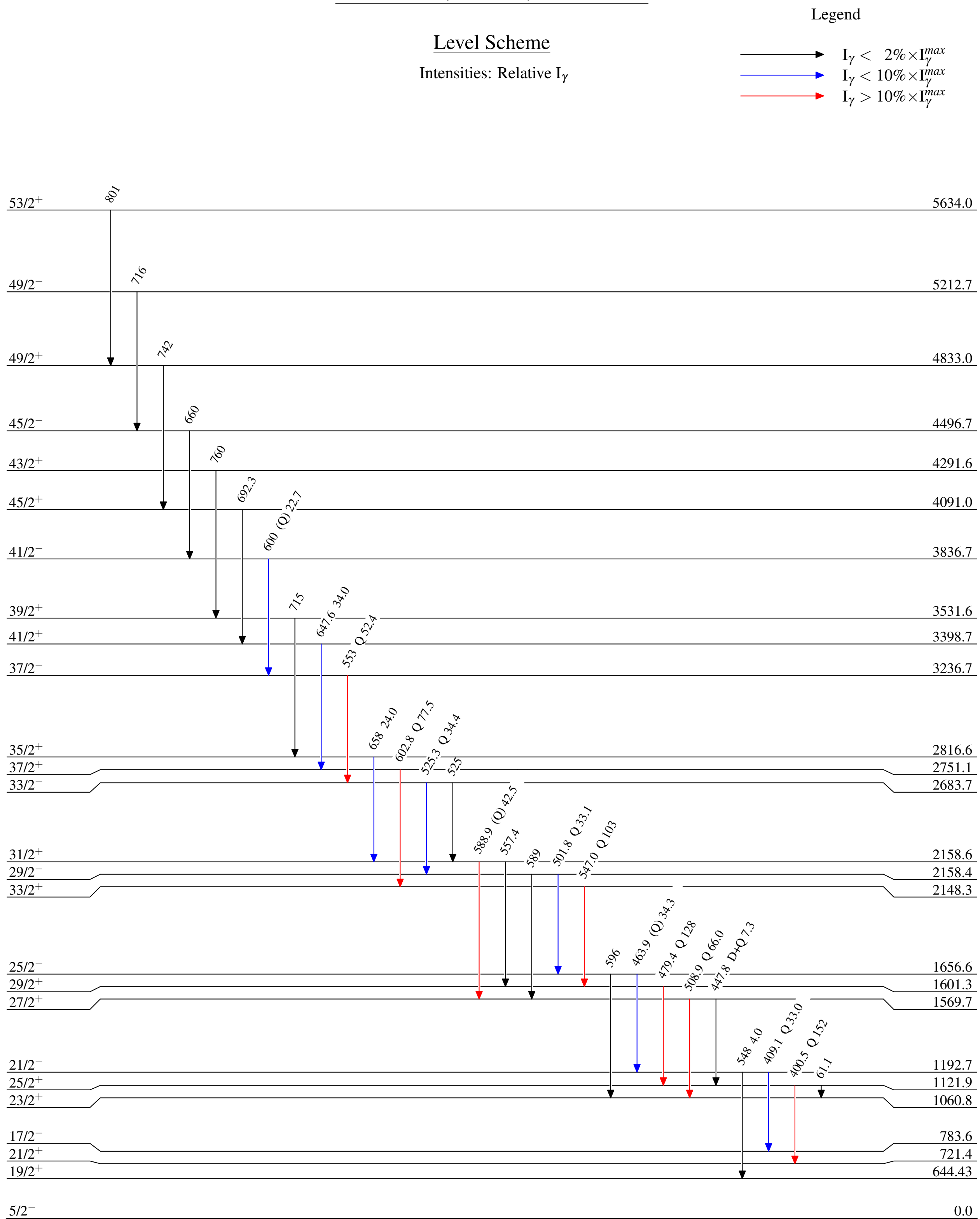
[b] From $\gamma(\theta)$ in ^{154}Sm(^{18}O,5nγ) (1982Ro08). Authors interpret stretched Q transitions as E2, ΔJ=1 or 0, D+Q transitions as M1+E2.

[c] 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.

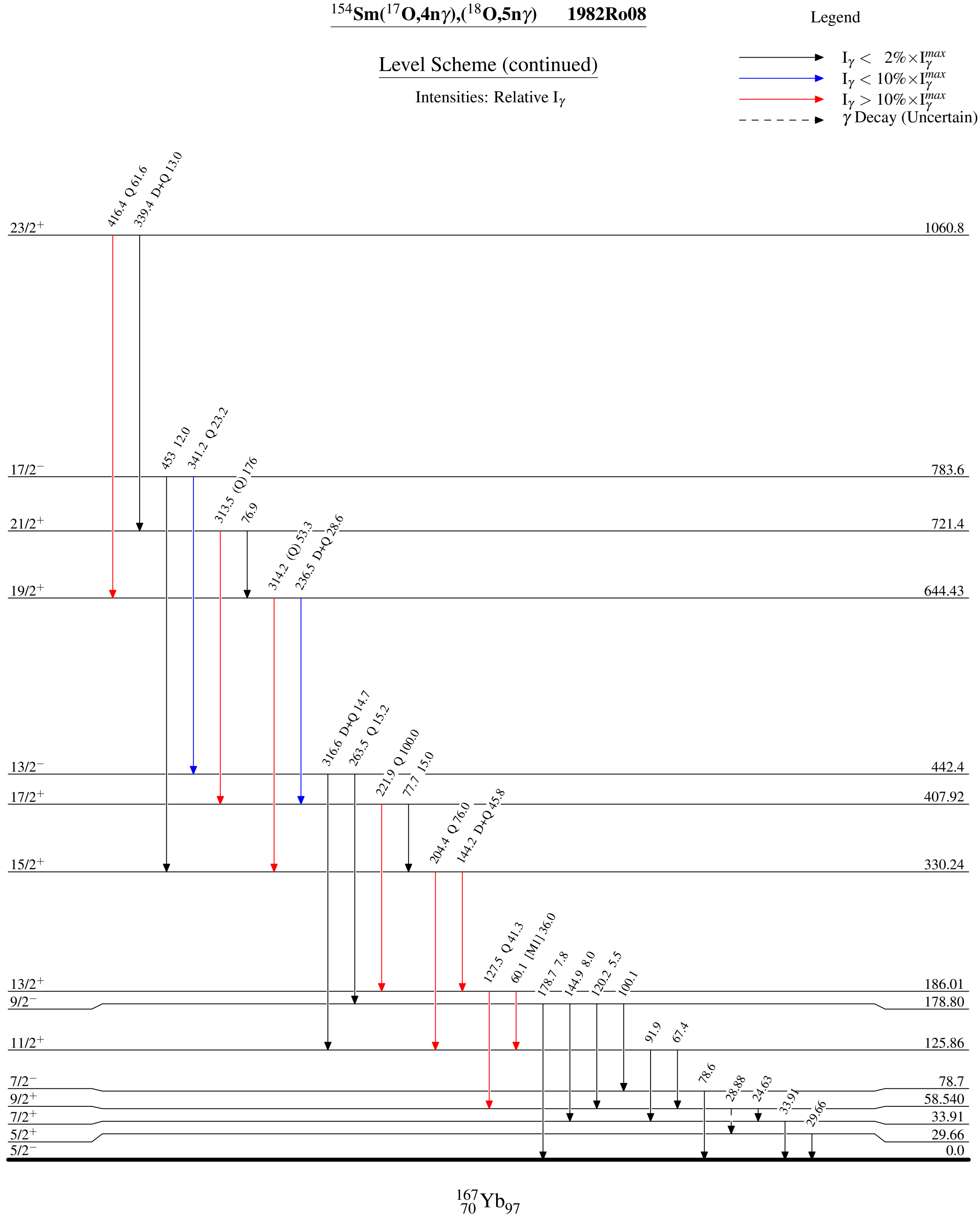
$^{154}Sm(^{17}O,4n\gamma),(^{18}O,5n\gamma)$ 1982Ro08

Level Scheme

Intensities: Relative I_γ

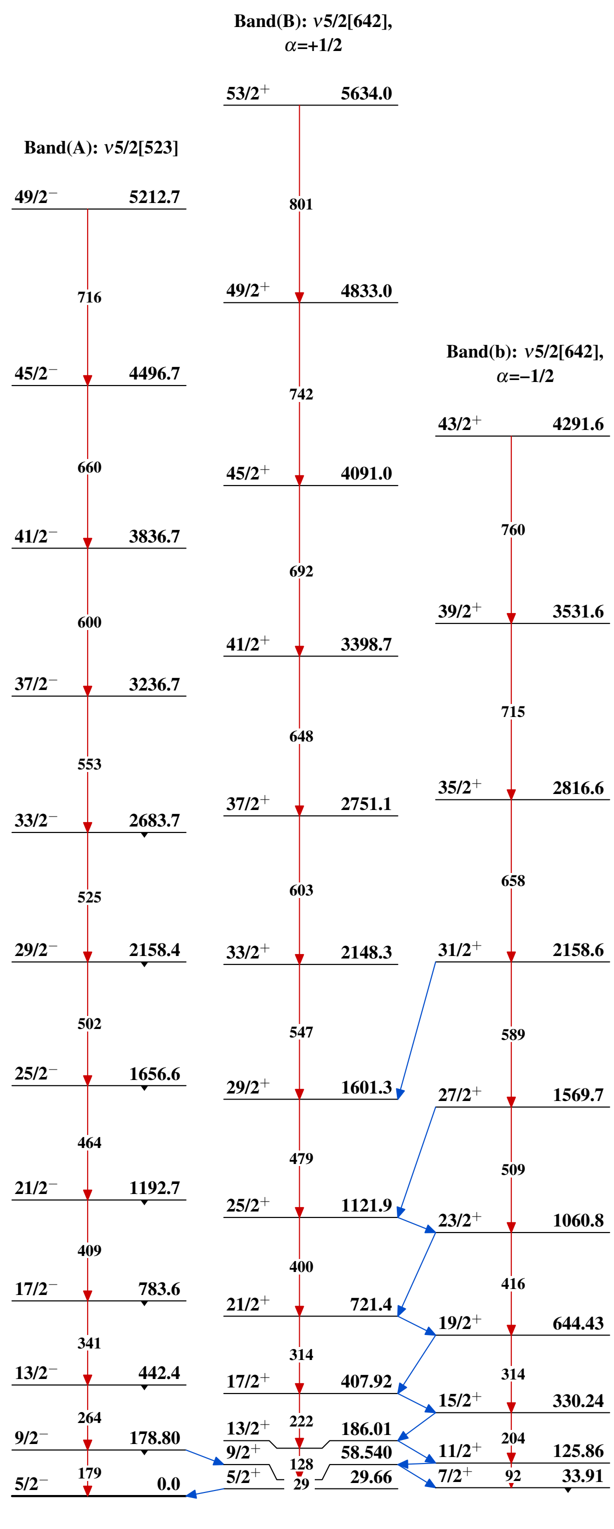


$^{167}_{70}Yb_{97}$



^{154}Sm(^{17}O,4nγ),(^{18}O,5nγ) 1982Ro08
Level Scheme (continued)
Intensities: Relative I_γ
Legend
I_γ < 2%×I_γ^{max}
I_γ < 10%×I_γ^{max}
I_γ > 10%×I_γ^{max}
γ Decay (Uncertain)
23/2+ 1060.8
416.4 Q 61.6
339.4 D+Q 13.0
17/2− 783.6
453 12.0
341.2 Q 23.2
21/2+ 721.4
313.5 (Q) 176
76.9
19/2+ 644.43
314.2 (Q) 53.3
236.5 D+Q 28.6
13/2− 442.4
316.6 D+Q 14.7
263.5 Q 15.2
17/2+ 407.92
221.9 Q 100.0
77.7 15.0
15/2+ 330.24
204.4 Q 76.0
144.2 D+Q 45.8
13/2+ 186.01
127.5 Q 41.3
60.1 [M1] 36.0
9/2− 178.80
178.7 7.8
144.9 8.0
120.2 5.5
100.1
11/2+ 125.86
91.9
67.4
7/2− 78.7
78.6
9/2+ 58.540
28.88
24.63
7/2+ 33.91
33.91
5/2+ 29.66
29.66
5/2− 0.0
$^{167}_{70}Yb_{97}$

$^{154}Sm(^{17}O,4n\gamma),(^{18}O,5n\gamma)$ 1982Ro08



$^{167}_{70}Yb_{97}$