^{85}Rb(α,2nγ), ^{74}Ge(^{18}O,4npγ)   1980Fi06,1986Wa25,1988Ko08

	History		
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson and W. D. Kulp(a)	NDS 129, 1 (2015)	27-Jul-2015

1980Fi06: ^{85}Rb(α,2nγ), E=24.1-36.1 MeV, measured γ spectrum, n-γ coincidences, $\gamma\gamma$ coincidences, $\gamma(\theta)$, and excitation functions.

1986Wa25: ^{74}Ge(^{18}O,4npγ), E=40-80 MeV, measured $\gamma\gamma$ coincidences and measured lifetimes by recoil-distance method.

1988Ko08: ^{85}Rb(α,2nγ), E=27 MeV, measured lifetimes by generalized centroid-shift method.

^{87}Y Levels

Scheme is from 1980Fi06.

E(level)	J$^{\pi\dagger}$	T$_{1/2}$‡	Comments
0	1/2$^{-\#}$		
380.80 10	9/2$^{+\#}$	13.37 h 3	T$_{1/2}$: From Adopted Levels.
793.60 10	5/2$^{-\#}$	≤10 ns	
1404.4 4	13/2$^{+\#}$	≤10 ns	
1590.61 15	11/2$^{+\#}$	≤10 ns	
1623.11 23	(5/2,7/2)$^{\#}$		
2037.7 4	(15/2$^+$)	≤10 ns	
2207.6 4			E(level): Based on subsequent measurements, it seems likely that the 170 keV γ depopulating this level is the same as that depopulating the 2649 keV level and therefore this level is not included in the Adopted Levels.
2366.8 3	15/2$^-$	≤10 ns	
2428.0 4	17/2$^{+\#}$	≤10 ns	
2478.81 25	13/2$^-$		
2648.7 3	15/2$^{(-)}$		
2675.9 3	17/2$^-$	0.25$^\&$ ns 10	
2827.1 4	(21/2$^+$)	0.53$^@$ ns 3	T$_{1/2}$: other: 0.75 ns 10 (1988Ko08). J$^\pi$: Definitive in Adopted Levels.
2961.3 3	17/2$^-$		
2986.9 4	(23/2$^+$)	<49$^@$ ps	T$_{1/2}$: other: < 0.1 ns (1988Ko08). J$^\pi$: assignment in Adopted Levels is (19/2$^+$) and decay includes γ to (17/2$^+$) level.
2995.4 4	(17/2)		
3094.4 5	(25/2)	<49$^@$ ps	T$_{1/2}$: other: < 0.1 ns (1988Ko08). J$^\pi$: (21/2) in Adopted Levels.
3401.6 4	(19/2$^-$)$^{\#}$		
3447?	(21/2$^-$)		J$^\pi$: (19/2$^-$) in Adopted Levels.
3553.4 5	(23/2$^+$)		J$^\pi$: Definitive in Adopted Levels.
3595.1 5	(21/2,23/2,25/2$^+$)$^{\#}$		
3595.3 5	(25/2$^+$)	0.5$^\&$ ns 2	J$^\pi$: (21/2$^+$) in Adopted Levels.
3765.8 4	(21/2)		J$^\pi$: (21/2$^-$) in Adopted Levels.
4040.2 5	(25/2)		J$^\pi$: 25/2$^+$ in Adopted Levels.
4214.9 5	(27/2)		J$^\pi$: Based on angular distribution and placement in cascade.

† From γ angular distributions and excitation in (α,2nγ) (1980Fi06), unless indicated otherwise.

‡ From delayed coincidences (1980Fi06) from general statement that all values are ≤ 10 ns, unless indicated otherwise.

$^\#$ From Adopted Levels.

$^@$ From 1986Wa25.

$^\&$ From 1988Ko08.

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$\gamma(^{87}$Y$)$

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[@]	Comments
27.2 _1_	≤2.4[#]	2675.9	17/2$^-$	2648.7	15/2$^{(-)}$	(M1)		Mult.: A$_2$=−0.44 _11_, A$_4$=+0.02 _15_, from Table 3, 1980Fi06 implying mult=dipole, and M1 from level structure.
107.5 _2_		3094.4	(25/2)	2986.9	(23/2$^+$)	D		Mult.: A$_2$=−0.28 _3_, A$_4$=+0.01 _5_, from Table 3, 1980Fi06.
159.8 _1_	20 _2_	2986.9	(23/2$^+$)	2827.1	(21/2$^+$)	D+Q	+0.06 _2_	Mult.: A$_2$=−0.15 _3_, A$_4$=+0.07 _4_, from Table 2, 1980Fi06.
169.9[a] _1_	≤19[a]	2207.6		2037.7	(15/2$^+$)			I$_\gamma$: from I$_\gamma$(169) ≤ I$_\gamma$(633), the following γ.
169.9[a] _1_	50[a] _11_	2648.7	15/2$^{(-)}$	2478.81	13/2$^-$	D+Q	+0.05 _2_	I$_\gamma$: from measured I$_\gamma$(169)=59 _6_ and I$_\gamma$(169)=9 _9_ deexciting the 2207 level. Mult.: A$_2$=−0.15 _2_, A$_4$=+0.09 _3_, from Table 2, 1980Fi06, but unresolved doublet.
174.7 _2_		4214.9	(27/2)	4040.2	(25/2)	D		Mult.: A$_2$=−0.21 _8_, A$_4$=−0.02 _10_.
247.9 _2_	8.2[#] _16_	2675.9	17/2$^-$	2428.0	17/2$^+$			E$_\gamma$: this placement is considered as questionable by 1980Fi06 because of possible ^{86}Y impurities; however, it is confirmed by 1988Ko08, because at the E$_\alpha$ value at which they have measured ^{86}Y is practically not produced. I$_\gamma$: Could be a doublet. Mult.: A$_2$=+0.14 _2_, A$_4$=−0.02 _3_, from Table 3, 1980Fi06.
285.4 _1_	18 _2_	2961.3	17/2$^-$	2675.9	17/2$^-$	D		
309.1 _1_	41[#] _5_	2675.9	17/2$^-$	2366.8	15/2$^-$	M1+E2	+0.20 _4_	Mult.: A$_2$=−0.44 _2_, A$_4$=+0.07 _3_, from Table 2, 1980Fi06. Angular distributions give D+Q and RUL eliminates E1+M2.
312.6 _3_	7.2 _51_	2961.3	17/2$^-$	2648.7	15/2$^{(-)}$			Mult.: A$_2$=−0.52 _11_, A$_4$=0, from Table 3, 1980Fi06. I$_\gamma$: Calculated using branching ratio of 0.29 _3_ from (^{11}B,4nγ).
346.7 _2_		2995.4	(17/2)	2648.7	15/2$^{(-)}$			Mult.: A$_2$=−0.36 _9_, A$_4$=−0.08 _12_, from Table 3, 1980Fi06.
364.2 _2_		3765.8	(21/2)	3401.6	(19/2$^-$)			Mult.: A$_2$=−0.14 _6_, A$_4$=0, from Table 3, 1980Fi06.
380.8 _1_		380.80	9/2$^+$	0	1/2$^-$	M4		Mult.: from ^{87m}Y isomeric decay.
399.1 _1_	100	2827.1	(21/2$^+$)	2428.0	17/2$^+$	Q		Mult.: A$_2$=+0.34 _2_, A$_4$=−0.07 _2_, from Table 2, 1980Fi06.
440.3 _2_		3401.6	(19/2$^-$)	2961.3	17/2$^-$			E$_\gamma$: Unresolved doublet. Mult.: A$_2$=+1.07 _7_, A$_4$=0, from Table 3, 1980Fi06.
486.8 _2_		4040.2	(25/2)	3553.4	(23/2$^+$)	D		Mult.: A$_2$=−0.74 _7_, A$_4$=+0.15 _8_, from Table 3, 1980Fi06.
608.4 _3_	≤5	3595.3	(25/2$^+$)	2986.9	(23/2$^+$)	D+Q	+0.06 _3_	Mult.: A$_2$=−0.15 _7_, A$_4$=0, from Table 2, 1980Fi06.
633.3 _2_	17 _2_	2037.7	(15/2$^+$)	1404.4	13/2$^+$	D+Q	+0.37 _7_	Mult.: A$_2$=−0.58 _3_, A$_4$=+0.02 _4_, from Table 2 1980Fi06.
725.7 _3_	25 _3_	3401.6	(19/2$^-$)	2675.9	17/2$^-$	D+Q	+0.26 _6_	Mult.: A$_2$=−0.51 _3_, A$_4$=0, from Table 2, 1980Fi06.
726.3 _3_	29 _3_	3553.4	(23/2$^+$)	2827.1	(21/2$^+$)	D+Q	+0.05 _2_	Mult.: A$_2$=−0.34 _2_, A$_4$=0, from Table 2, 1980Fi06.

Continued on next page (footnotes at end of table)

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γ(^{87}Y) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[@]	Comments
768.0 _3_	<48	3595.1	(21/2,23/2,25/2$^+$)	2827.1	(21/2$^+$)			Mult.: A$_2$=−0.06 _2_, A$_4$=−0.02 _4_, from Table 2, 1980Fi06, but unresolved doublet. I$_\gamma$: Unresolved double with 771 γ from 3447.
771.0[b] _3_	<32	3447?	(21/2$^-$)	2675.9	17/2$^-$	Q		Mult.: A$_2$=+0.28 _6_, A$_4$=0.02, from Table 2, 1980Fi06, but unresolved doublet. I$_\gamma$: Unresolved doublet with 768 γ from 3595 level.
793.6 _1_	121 _13_	793.60	5/2$^-$	0	1/2$^-$	Q		Mult.: A$_2$=+0.26 _2_, A$_4$=+0.03 _3_, from Table 2, 1980Fi06.
(829.5 _2_)		1623.11	(5/2,7/2)	793.60	5/2$^-$			E$_\gamma$: from Adopted Levels. Mult.: A$_2$=+1.10 _10_, A$_4$=+0.25 _10_ from Table 1, 1980Fi06, but authors state that contaminant peaks add unknown systematic error.
888.2 _1_	56 _6_	2478.81	13/2$^-$	1590.61	11/2$^+$	D		Mult.: A$_2$=−0.20 _2_, A$_4$=+0.06 _3_, from Table 2, 1980Fi06.
962.4 _1_	82 _9_	2366.8	15/2$^-$	1404.4	13/2$^+$	D		Mult.: A$_2$=−0.18 _2_, A$_4$=+0.02 _3_, from Table 2, 1980Fi06.
1023.6[&] _1_	648[&] _71_	1404.4	13/2$^+$	380.80	9/2$^+$	Q		
1023.6[&] _1_	648[&] _71_	2428.0	17/2$^+$	1404.4	13/2$^+$	Q		Mult.: A$_2$=+0.28 _2_, A$_4$=−0.03 _3_, from Table 2, 1980Fi06, but unresolved doublet.
1209.8 _1_	108 _12_	1590.61	11/2$^+$	380.80	9/2$^+$	D+Q	+1.0 _4_	Mult.: A$_2$=−0.92 _2_, A$_4$=+0.31 _3_, from Table 2, 1980Fi06.

[†] From 1980Fi06.
[‡] Relative I$_\gamma$ measured at E=24.6 MeV in (α,2nγ) (1980Fi06).
[#] From (^{11}B,4nγ) Iγ(247.9)/Iγ(309.1)=0.20 _3_ and as the 247.9γ in 1980Fi06 may be a doublet, Iγ(27.2)/Iγ(247.9)≤0.24.
[@] From γ angular distribution (1980Fi06) at E=24.6 MeV, unless otherwise noted.
[&] Multiply placed with undivided intensity.
[a] Multiply placed with intensity suitably divided.
[b] Placement of transition in the level scheme is uncertain.

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Legend

Level Scheme

Intensities: Type not specified
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

→	$I_\gamma < 2\% \times I_\gamma^{max}$
→	$I_\gamma < 10\% \times I_\gamma^{max}$
→	$I_\gamma > 10\% \times I_\gamma^{max}$
⇢	γ Decay (Uncertain)
●	Coincidence

$^{87}_{39}$Y$_{48}$