^{82}Se(^{11}B,3nγ) 2002Ra13

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. Mccutchan	NDS 165, 1 (2020)	1-Mar-2020

2002Ra13: E=37 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$(DCO); lifetimes by Doppler-shift attenuation method using GASP array consisting of 40 escape-suppressed HPGe detectors and an inner ball containing 80 BGO elements.

^{90}Y Levels

For detailed shell-model configurations see Tables III, IV, VI and VII in 2002Ra13.

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
0.0	2$^-$	64.05[@] h *5*	
202.51 *3*	3$^-$		
682.02[b] *6*	7$^+$	3.19[@] h *6*	J$^\pi$: from Adopted Levels.
2216.7[b] *4*	8$^+$		
2858.9[b] *5*	9$^+$		
3097.1[b] *6*	10$^+$		
4212.6[b] *6*	11$^+$		
4518.6[b] *6*	12$^+$		
4543.6 *6*	11$^+$		
5068.5 *6*			
5102.6 *6*	12$^-$		
5111.5[b] *6*	13$^+$		
5359.7[b] *6*	14$^+$		
5525.6 *6*	12$^{(+)}$		
5541.2 *6*	12$^{(+)}$		
5674.3 *6*	12$^{(+)}$		
6065.0 *6*	13$^-$		
6234.8[c] *6*	13$^-$		
6822.6 *6*	13$^+$		
6831.1 *6*	13$^+$		
6898.2[c] *6*	15$^-$		
7355.6[a] *6*	14$^{(+)}$		
7882.7?[a] *6*	15$^{(+)}$	0.111[&] ps *28*	E(level): since the reversed ordering of the 538.7-527.2 cascade is not ruled out, this level is either at 7882.9 or 7894.4.
7994.1[c] *6*	16$^{(-)}$		
8421.4[a] *6*	16$^{(+)}$	0.57[&] ps *8*	
9006.0[a] *6*	17$^{(+)}$	0.37 ps *6*	
9317.2[c] *7*			
9635.2[a] *7*	(18$^+$)	0.38 ps *6*	

[†] From least-squares fit to Eγ, by evaluators.
[‡] As proposed in 2002Ra13, based on literature values for lower-lying states and multipolarity deduced from $\gamma\gamma(\theta)$(DCO).
[#] From DSAM measurements (2002Ra13), except where noted.
[@] From the Adopted Levels.
[&] Since the reversed ordering of the 538.7-527.2 cascade is not ruled out, the lifetimes of the levels at 7882.9 and 8421.5 are affected by the ordering of this cascade.
[a] Band(A): Band based on 14$^{(+)}$.
[b] Seq.(B): γ cascade based on 7$^+$.
[c] Seq.(C): Band based on 13$^-$.

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$\gamma(^{90}Y)$

DCO ratios correspond to gates on ΔJ=2, Q transitions, unless otherwise stated. DCO ratios constructed from ratio of γ rays detected at an average of 35° and 145°, with γ rays detected at 90°. Expected ratios are 1.0 if gating and observed transitions are stretched transitions of pure and equal multipole order, 0.54 for a pure dipole transition gated on a stretched Q transition, and 1.85 for a Q transition gated on a dipole transition.

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
202.51 *3*		202.51	3^-	0.0	2^-			E_γ: from the Adopted Gammas. Other: 202.6 (2002Ra13).
238.2 *1*	74.0 *2*	3097.1	10^+	2858.9	9^+	D		DCO=0.98 *1* (ΔJ=1 dipole gated).
248.2 *2*	11.0 *2*	5359.7	14^+	5111.5	13^+	D		DCO=0.51 *6*.
305.9 *1*	18.0 *1*	4518.6	12^+	4212.6	11^+	D		DCO=0.54 *1*.
390.9 *3*	0.5 *1*	6065.0	13^-	5674.3	$12^{(+)}$	D		DCO=1.0 *2* (ΔJ=1 dipole gated).
479.51 *5*		682.02	7^+	202.51	3^-			E_γ: from the Adopted Gammas. Other: 479.5 (2002Ra13).
523.9 *2*	1.0 *1*	6065.0	13^-	5541.2	$12^{(+)}$	D		DCO=0.52 *7*.
524.4 *1*	5.6 *2*	7355.6	$14^{(+)}$	6831.1	13^+	D		DCO=0.50 *1*.
527.2 *2*	6.2 *2*	7882.7?	$15^{(+)}$	7355.6	$14^{(+)}$	D		DCO=0.30 *2*.
533.0 *1*	4.2 *1*	7355.6	$14^{(+)}$	6822.6	13^+	D		DCO=0.43 *4*.
538.7 *1*	5.8 *2*	8421.4	$16^{(+)}$	7882.7?	$15^{(+)}$	D		DCO=0.30 *2*.
539.4 *3*	1.0 *1*	6065.0	13^-	5525.6	$12^{(+)}$	D		DCO=0.63 *8*.
584.5 *1*	5.9 *2*	9006.0	$17^{(+)}$	8421.4	$16^{(+)}$	D		DCO=0.65 *8*.
593.0 *2*	7.8 *4*	5111.5	13^+	4518.6	12^+			
629.2 *3*	4.0 *1*	9635.2	(18^+)	9006.0	$17^{(+)}$			
642.2 *3*	97.7 *5*	2858.9	9^+	2216.7	8^+	D		DCO=0.53 *1*.
663.3 *3*	1.3 *6*	6898.2	15^-	6234.8	13^-	Q		DCO=1.3 *2*.
833.1 *3*	14.0 *5*	6898.2	15^-	6065.0	13^-	Q		DCO=1.00 *5*.
890.2 *6*	23.9 *8*	5102.6	12^-	4212.6	11^+	D		DCO=1.01 *8* (ΔJ=1 dipole gated).
898.8 *2*	11.1 *2*	5111.5	13^+	4212.6	11^+	Q		DCO=0.90 *3*.
962.5 *2*	8.4 *2*	6065.0	13^-	5102.6	12^-	D+Q		DCO=0.7 *2* (ΔJ=1 dipole gated).
1065.8 *7*	2.1 *2*	8421.4	$16^{(+)}$	7355.6	$14^{(+)}$			
1095.9 *2*	1.3 *1*	7994.1	$16^{(-)}$	6898.2	15^-	D		DCO=0.5 *1*.
1115.4 *1*	38.4 *2*	4212.6	11^+	3097.1	10^+	D		DCO=0.91 *1* (ΔJ=1 dipole gated).
1323.1 *3*	0.4 *1*	9317.2		7994.1	$16^{(-)}$			
1353.7 *3*	14.5 *2*	4212.6	11^+	2858.9	9^+	Q		DCO=1.81 *3* (ΔJ=1 dipole gated).
1421.6 *1*	27.6 *5*	4518.6	12^+	3097.1	10^+	Q		DCO=1.75 *2* (ΔJ=1 dipole gated).
1446.6 *2*	4.1 *1*	4543.6	11^+	3097.1	10^+	D+Q		DCO=0.79 *4* (ΔJ=1 dipole gated).
1534.7 *4*	100.0 *3*	2216.7	8^+	682.02	7^+	M1+E2	−0.68 *5*	Mult.,δ: DCO=1.10 *2* gives D+Q, non-zero value of δ suggests M1+E2.
1538.4 *1*	6.3 *2*	6898.2	15^-	5359.7	14^+	D		DCO=0.60 *6*.
1546.0 *3*	7.7 *1*	6065.0	13^-	4518.6	12^+	D		DCO=1.07 *2* (ΔJ=1 dipole gated).
1711.0 *6*	4.3 *3*	6822.6	13^+	5111.5	13^+			
1716.1 *5*	1.3 *6*	6234.8	13^-	4518.6	12^+	D		DCO=0.45 *2*.
1719.6 *2*	2.2 *1*	6831.1	13^+	5111.5	13^+	D		DCO=1.4 *3* (ΔJ=1 dipole gated).
1719.9 *4*	1.1 *1*	6822.6	13^+	5102.6	12^-	D		DCO=1.2 *1* (ΔJ=1 dipole gated).
1728.4 *3*	0.9 *1*	6831.1	13^+	5102.6	12^-	D		DCO=1.1 *1* (ΔJ=1 dipole gated);
1754.1 *1*	5.1 *7*	6822.6	13^+	5068.5				
1760.7 *5*	1.4 *4*	6831.1	13^+	5068.5				E_γ: poor fit. Level-energy difference=1762.6.
1971.3 *9*	0.5 *1*	5068.5		3097.1	10^+			
2209.5 *1*	7.1 *3*	5068.5		2858.9	9^+			
2279.4 *6*	0.9 *2*	6822.6	13^+	4543.6	11^+			
2287.5 *4*	2.6 *1*	6831.1	13^+	4543.6	11^+			
2303.9 *3*	0.8 *1*	6822.6	13^+	4518.6	12^+			
2313.1 *4*	0.8 *1*	6831.1	13^+	4518.6	12^+			
2379.6 *3*	1.4 *1*	6898.2	15^-	4518.6	12^+			

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^{82}Se(^{11}B,3nγ) 2002Ra13 (continued)

$\gamma(^{90}Y)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π
2428.4 *7*	1.2 *1*	5525.6	$12^{(+)}$	3097.1	10^+
2444.3 *7*	1.1 *3*	5541.2	$12^{(+)}$	3097.1	10^+
2577.4 *4*	0.9 *1*	5674.3	$12^{(+)}$	3097.1	10^+
2968.3 *9*	1.0 *1*	6065.0	13^-	3097.1	10^+

† From 2002Ra13, except where noted.
‡ Based on $\gamma\gamma(\theta)$(DCO) measurements in 2002Ra13.

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Level Scheme

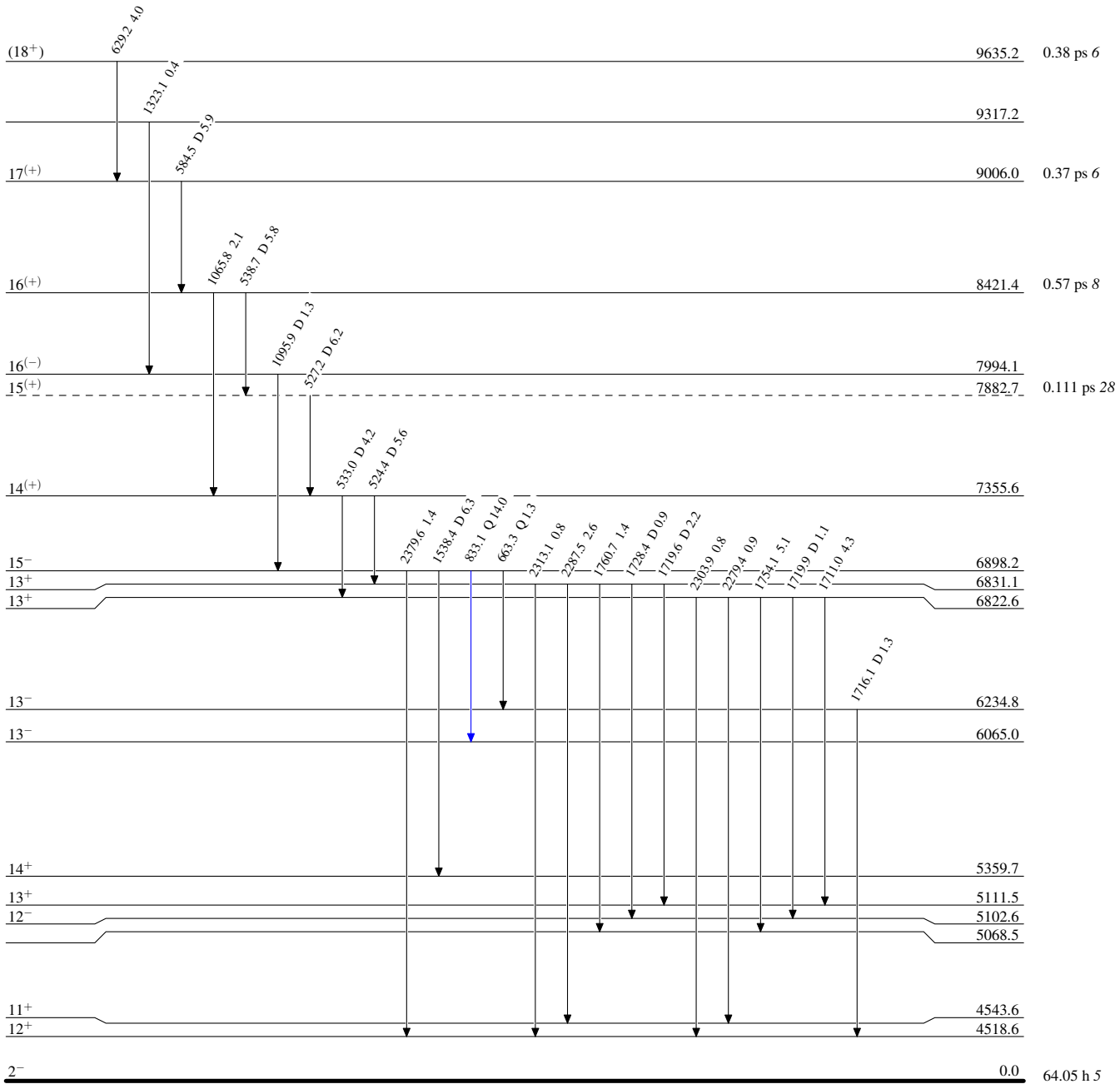
Intensities: Relative I_γ

Legend

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

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

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



$^{90}_{39}Y_{51}$

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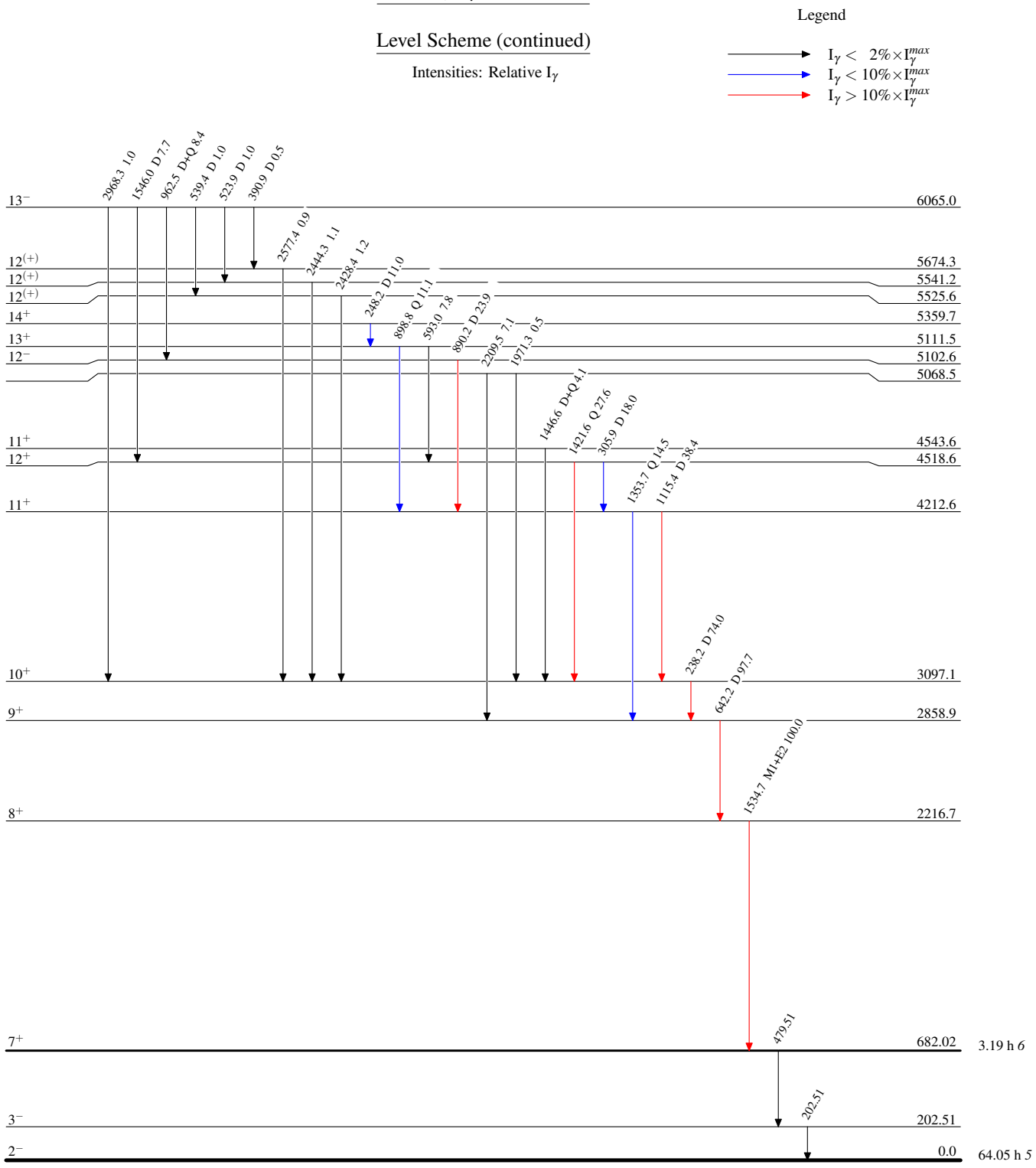
Level Scheme (continued)

Intensities: Relative I_γ



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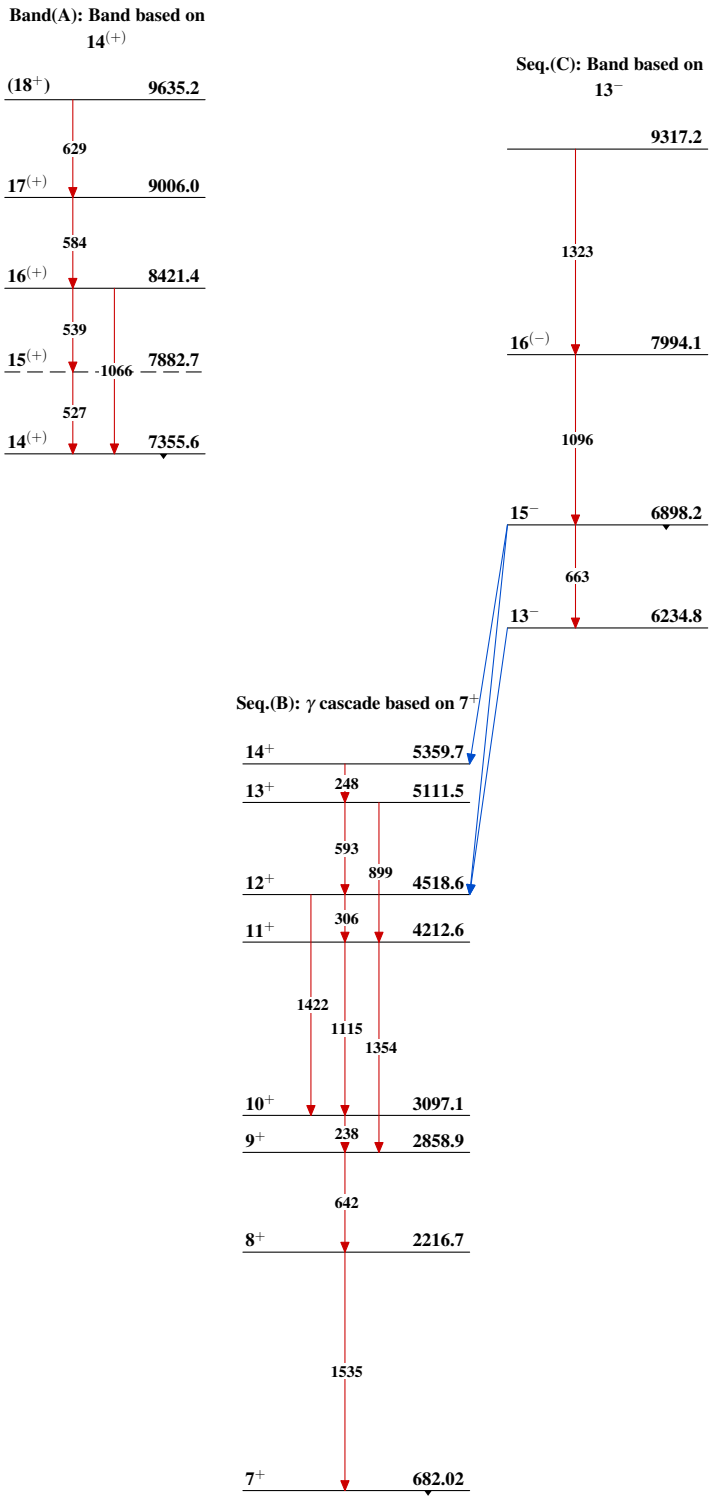

$^{90}_{39}Y_{51}$