^{123}Sb(^{19}F,4nγ) 1994De11

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 146, 1 (2017)	30-Sep-2017

1994De11: E=75 MeV ^{19}F beam was produced from the XTU Legnaro tandem accelerator. Target was 1 mg/cm^2 isotropically enriched ^{123}Sb rolled on a 5 mg/cm^2 natural Au backing. γ rays were detected with an array of six Ge detectors with BGO anti-Compton shields and with a multiplicity filer of fourteen hexagonally shaped BaF_2 crystals in two groups. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma$(DCO). Deduced levels, J, π. Comparisons with Total Routhian surface (TRS) and Interacting boson model (IBM) calculations.

^{138}Nd Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
0[@]	0$^+$		
520.82[@] *18*	2$^+$		
1013.95[&] *21*	2$^+$		
1249.8[@] *3*	4$^+$		
1451.9[&] *3*	3$^+$		
1842.9[&] *3*	4$^+$		
1990.5 *4*	5$^-$		
2134.3[@] *4*	6$^+$		
2221.8 *4*	5$^-$		
2321.9 *4*	7$^-$		
2691.4 *4*	7$^-$		
2695.8 *4*	8$^+$		
2981.1 *4*	8$^+$		
3108.0[@] *4*	8$^+$		
3175.0 *4*	10$^+$	370 ns *5*	Configuration=$(\nu\ h_{11/2})^{-2}_{10+}$.
3240.5 *5*	9$^-$		
3247.4 *4*	9$^-$		
3372.1 *4*	9$^-$		
3701.2[a] *4*	10$^+$		Configuration=$(\pi\ h_{11/2})^{2}_{10+}$.
3822.0 *5*	12$^+$		
3915.6 *4*	11$^-$		
4136.8 *5*	11		
4204.0[a] *5*	12$^+$		
4211.1 *5*	11$^-$		
4219.3 *6*	11$^-$		
4752.4 *5*	13$^-$		
4940.4 *5*	12		
4975.5 *5*	13		
4996.5[a] *6*	14$^+$		
5029.9 *5*	14$^+$		
5119.4 *7*			
5233.7 *6*			
5253.9 *5*	13		
5350.6 *6*	14		
5436.7 *6*	13		
5470.1 *5*	15		
5577.9 *5*	14		
5615.5 *5*	14		
5744.0 *7*	15		
5749.0 *6*	16		
5760.2 *6*	15		
5771.7 *5*	15		

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^{123}Sb(^{19}F,4nγ) 1994De11 (continued)

^{138}Nd Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
5843.9[a] *7*	16+	6289.2 *6*	(17)	6830.8[a] *7*	18+
6002.9 *5*	16+	6471.8 *7*	(17)	7048.8 *7*	(19)
6153.2 *7*	16	6568.0 *6*	(18)	7428.4 *7*	(19)
6243.0 *5*	17	6669.7 *6*	(18)	7565.5 *7*	(20)
				8490.2 *8*	(21)

† From a least-squares fit to γ-ray energies, assuming $\Delta E\gamma$=1 keV when unknown.
‡ From 1994De11 based on $\gamma\gamma$(DCO) and band structure. Please refer to Adopted Levels for adopted assignments.
# From Adopted Levels.
@ Band(A): Ground state band.
& Band(B): γ band.
a Band(C): Band based on 3701,10+ level.

γ(^{138}Nd)

E_γ†	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	Comments
33#&		5470.1	15	5436.7	13		
67#		3175.0	10+	3108.0	8+		
127#&		3108.0	8+	2981.1	8+		
144#&		2134.3	6+	1990.5	5−		
156.0 *2*	7	5771.7	15	5615.5	14		
187.0 *2*	10	2321.9	7−	2134.3	6+	D	DCO=0.70 *9*.
193.8 *2*	29	5771.7	15	5577.9	14	D	DCO=0.45 *5*.
230.8 *3*	40	6002.9	16+	5771.7	15	D	DCO=0.38 *5*.
231.0 *3*	28	2221.8	5−	1990.5	5−	D	DCO=0.61 *7*.
278.0 *4*	49	5253.9	13	4975.5	13	D	DCO=0.70 *8*.
278.6 *4*	30	5749.0	16	5470.1	15	D	DCO=0.64 *8*.
286.3 *2*	41	6289.2	(17)	6002.9	16+	D	DCO=0.37 *5*.
313.5 *2*	46	5253.9	13	4940.4	12	D	DCO=0.68 *7*.
323.7 *3*	35	5577.9	14	5253.9	13	D	DCO=0.51 *6*.
325.2 *3*	22	6568.0	(18)	6243.0	17	D	DCO=0.69 *8*.
329.6 *3*	54	3701.2	10+	3372.1	9−	D	DCO=0.68 *7*.
331.4 *3*	250	2321.9	7−	1990.5	5−	Q	DCO=0.95 *10*.
369.3 *3*	19	2691.4	7−	2321.9	7−	(Q)	DCO=0.88 *10*.
372.8 *3*	37	2695.8	8+	2321.9	7−	D	DCO=0.58 *7*.
379.1 *3*	30	7048.8	(19)	6669.7	(18)		
380.5 *2*	49	6669.7	(18)	6289.2	(17)	D	DCO=0.66 *8*.
390.9 *2*	19	3372.1	9−	2981.1	8+	D	DCO=0.68 *8*.
438.0 *2*	9	1451.9	3+	1013.95	2+		
440.1 *2*	32	5470.1	15	5029.9	14+	D	DCO=0.37 *5*.
453.6 *2*	176	3701.2	10+	3247.4	9−	D	DCO=0.51 *5*.
469.6 *2*	118	2691.4	7−	2221.8	5−	Q	DCO=0.90 *10*.
493.1 *2*	9	1013.95	2+	520.82	2+		
494.7 *2*	16	5470.1	15	4975.5	13	Q	DCO=1.09 *13*.
502.8 *2*	227	4204.0	12+	3701.2	10+	E2	DCO=0.99 *10*.
516.7 *2*	15	7565.5	(20)	7048.8	(19)	D	DCO=0.40 *6*.
520.8 *2*	1000	520.82	2+	0	0+	Q	DCO=1.00 *7*.
543.6 *2*	20	3915.6	11−	3372.1	9−	(Q)	DCO=0.88 *10*.
555.8 *3*	345	3247.4	9−	2691.4	7−		
556.9 *3*	368	2691.4	7−	2134.3	6+		

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^{123}Sb(^{19}F,4nγ) 1994De11 (continued)

γ(^{138}Nd) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
562.2 *2*	9	2695.8	8^+	2134.3	6^+	(Q)	DCO=0.88 *11*.
602.6 *2*	8	5577.9	14	4975.5	13		
627.9 *3*	10	6471.8	(17)	5843.9	16^+	D	DCO=0.70 *9*.
639.5 *3*	52	5615.5	14	4975.5	13	Q	DCO=1.09 *12*.
647.1 *2*	108	3822.0	12^+	3175.0	10^+	Q	DCO=1.09 *11*.
659.1 *2*	56	2981.1	8^+	2321.9	7^-	D	DCO=0.51 *6*.
668.3 *2*	80	3915.6	11^-	3247.4	9^-	Q	DCO=0.99 *10*.
676.9 *3*	92	3372.1	9^-	2695.8	8^+	D	DCO=0.40 *5*.
680.8 *3*	84	3372.1	9^-	2691.4	7^-	Q	DCO=0.90 *10*.
701.2 *3*	19	2691.4	7^-	1990.5	5^-	Q	DCO=0.89 *11*.
729.0 *2*	1000	1249.8	4^+	520.82	2^+	Q	DCO=1.02 *6*.
740.4[@] *3*	353[@]	3915.6	11^-	3175.0	10^+		DCO=0.60 *7* for the 740.6+740.4 doublet.
740.6[@] *3*	353[@]	1990.5	5^-	1249.8	4^+		DCO=0.60 *7* for the 740.6+740.4 doublet.
747.5 *3*	13	5744.0	15	4996.5	14^+	D	DCO=0.65 *12*.
773.0 *2*	26	6243.0	17	5470.1	15	Q	DCO=0.92 *12*.
792.5 *3*	163	4996.5	14^+	4204.0	12^+	E2	DCO=1.08 *11*.
803.4 *3*	66	4940.4	12	4136.8	11	D	DCO=0.70 *8*.
818.8 *3*	9	6568.0	(18)	5749.0	16		
829.0 *2*	8	1842.9	4^+	1013.95	2^+		
836.9 *3*	69	4752.4	13^-	3915.6	11^-	Q	DCO=0.93 *10*.
839.0 *3*	18	4211.1	11^-	3372.1	9^-	Q	DCO=0.93 *12*.
847.4 *3*	99	5843.9	16^+	4996.5	14^+	E2	DCO=0.95 *11*.
860.4 *3*	14	7428.4	(19)	6568.0	(18)		
884.4 *2*	467	2134.3	6^+	1249.8	4^+	Q	DCO=0.99 *8*.
900.1 *3*	6	5119.4		4219.3	11^-		
918.6 *3*	51	3240.5	9^-	2321.9	7^-	Q	DCO=0.99 *10*.
924.7 *3*	10	8490.2	(21)	7565.5	(20)	D	DCO=0.70 *10*.
961.7 *3*	116	4136.8	11	3175.0	10^+	D	DCO=0.41 *5*.
972.4 *3*	98	2221.8	5^-	1249.8	4^+	D	DCO=0.52 *6*.
973.3[@] *3*	119[@]	6002.9	16^+	5029.9	14^+		
973.5[@] *2*	119[@]	3108.0	8^+	2134.3	6^+		
978.8 *3*	22	4219.3	11^-	3240.5	9^-	Q	DCO=0.96 *13*.
986.9 *3*	30	6830.8	18^+	5843.9	16^+	E2	DCO=0.95 *12*.
1007.8 *3*	28	5760.2	15	4752.4	13^-	Q	DCO=1.06 *14*.
1014.0 *3*	10	1013.95	2^+	0	0^+		
1019.4 *3*	18	5771.7	15	4752.4	13^-	Q	DCO=0.96 *15*.
1022.6 *4*	10	5233.7		4211.1	11^-		
1118.4 *3*	10	4940.4	12	3822.0	12^+		
1146.6 *3*	22	5350.6	14	4204.0	12^+	Q	DCO=0.98 *16*.
1153.2 *4*	61	4975.5	13	3822.0	12^+	D	DCO=0.47 *8*.
1156.7 *3*	23	6153.2	16	4996.5	14^+	Q	DCO=1.02 *20*.
1208.0 *3*	86	5029.9	14^+	3822.0	12^+	Q	DCO=1.06 *19*.
1614.7 *4*	35	5436.7	13	3822.0	12^+	D	DCO=0.64 *15*.

[†] From 1994De11, unless noted otherwise. Error on intensities $\Delta I\gamma$=10-40% depending on intensity and complexity of the peak (1994De11).

[‡] Not given in 1994De11, deduced by evaluator based on E2-gated DCO values in 1994De11. Expected E2-gated DCO values are ≈1 for stretched quadrupole transitions and ≈0.5 for stretched dipole transitions. For many γ rays with DCO values ≈0.7, the corresponding multipolarity is assigned as D, even though, a Q component may be present.

[#] A transition, presumably highly converted, is indicated in the 1994De11 level scheme, but is not listed in the table of γ rays.

[@] Multiply placed with undivided intensity.

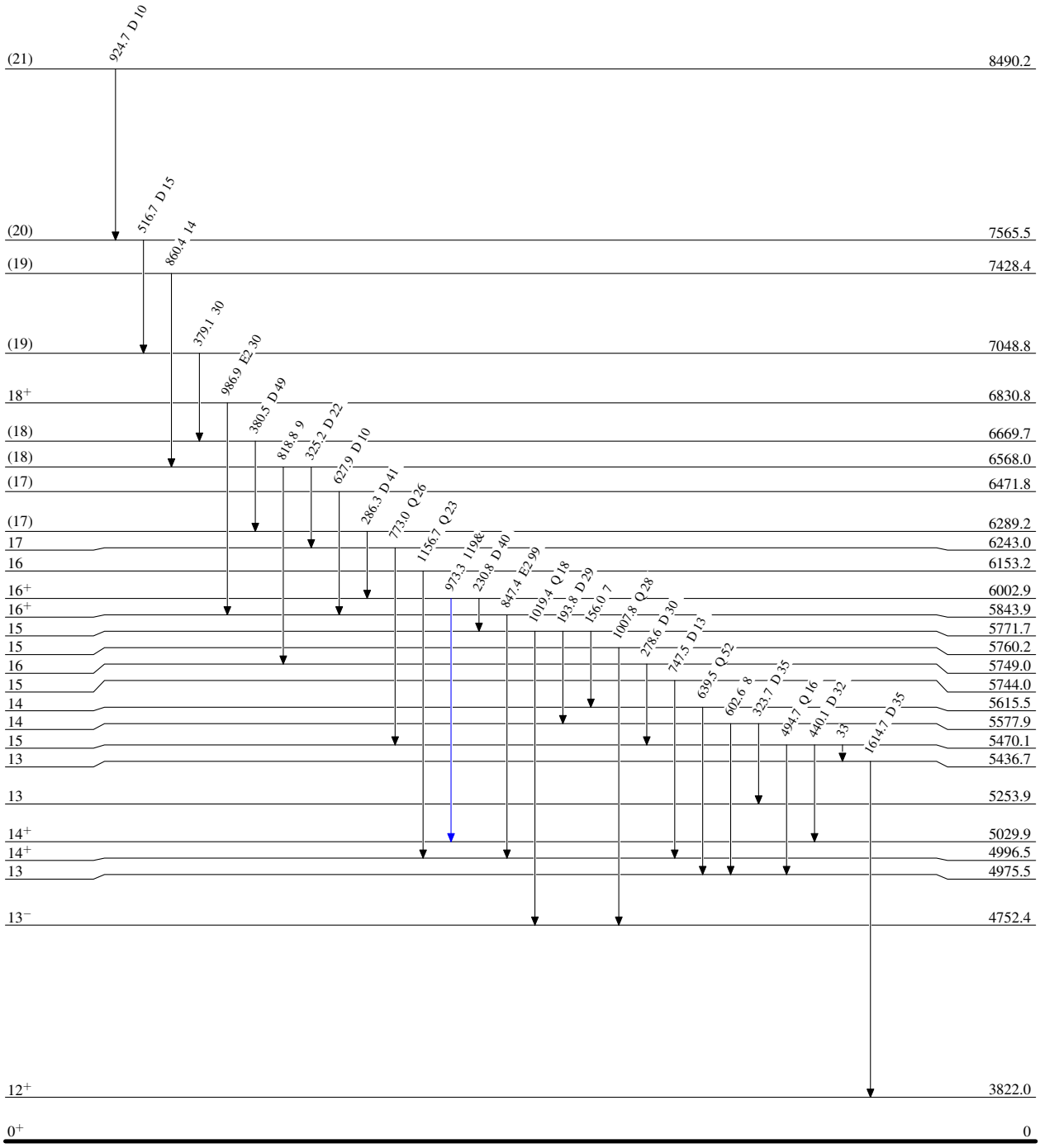
[&] Placement of transition in the level scheme is uncertain.

^{123}Sb(^{19}F,4nγ) 1994De11

Level Scheme

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



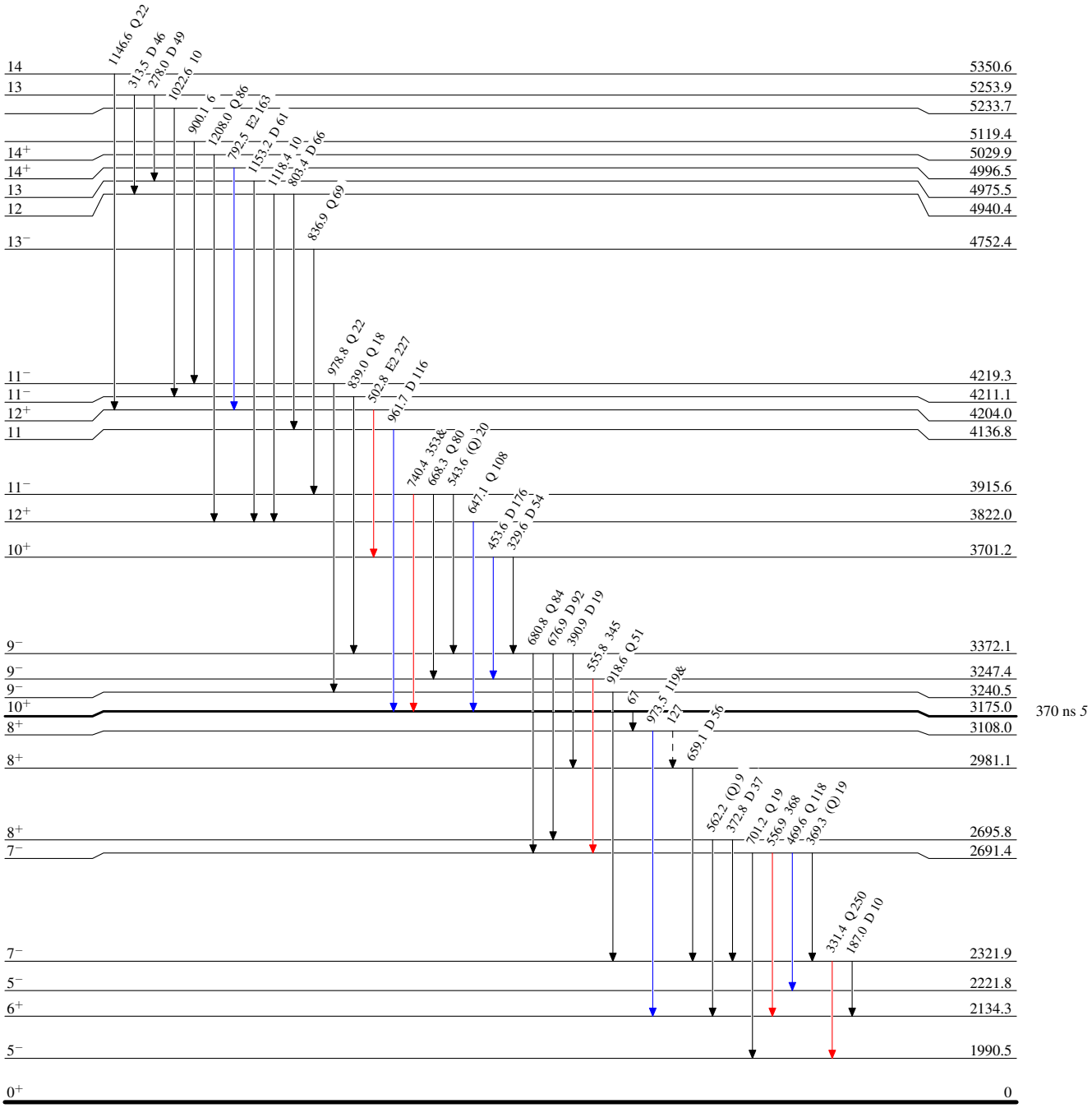
$^{138}_{60}Nd_{78}$

^{123}Sb(^{19}F,4nγ) 1994De11

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



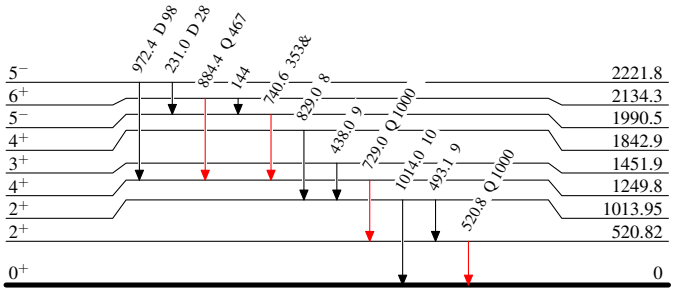
$^{138}_{60}Nd_{78}$

^{123}Sb(^{19}F,4nγ) 1994De11

Level Scheme (continued)

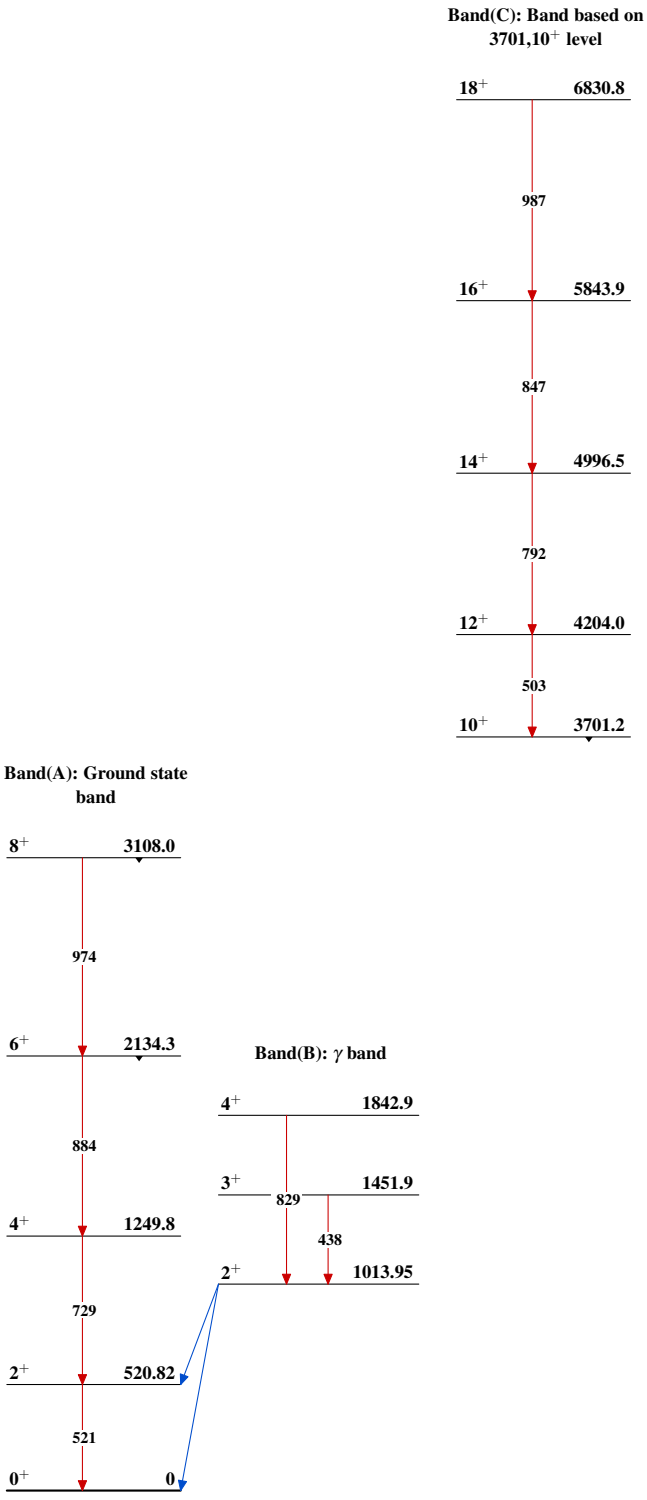
Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{138}_{60}Nd_{78}$

^{123}Sb(^{19}F,4nγ) 1994De11



$^{138}_{60}Nd_{78}$