^{152}Sm(^{16}O,4nγ) 1995No04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen[#]	NDS 147, 1 (2018)	30-Nov-2017

Includes ^{168}Er(α,8nγ) (1972Li34); ^{159}Tb(^{14}N,X) (1978Zo02); ^{159}Tb(^{11}B,6nγ) (1965St03) and ^{150}Sm(^{16}O,4nγ) (1986Jo02).

1995No04 (also 1992Ek01,1996No12): E=83.2 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$ using NORDBALL array of 20 Compton-suppressed HPGe detectors, Cranked Shell-model calculations.

1986Jo02: ^{152}Sm(^{16}O,4nγ) E=81 MeV and ^{150}Sm(^{16}O,4nγ) E=81-84 MeV. Measured Eγ, Iγ, ce, $\gamma\gamma$ coin, $\gamma(\theta)$ using Ge detectors and mini-orange spectrometer with a Si(Li) detector for electrons. Cranked Shell-model calculations. This work is from the same laboratory as 1995No04.

1979Ri06, 1978Ba16: ^{152}Sm(^{16}O,4nγ) E=85, 90 MeV. Measured Ce(t); recoil-shadow method for level half-lives.

1972Li14,1972Li34, 1972Da33: ^{168}Er(α,8nγ) E=100-112 MeV, measured Eγ, $\gamma\gamma$ coin, $\gamma(\theta)$. The ground-state band reported up to 16^+.

1978Zo02: ^{159}Tb(^{14}N,X) E=115 MeV. Measured $\alpha\gamma$ coin. The ground-state band deduced up to 20^+.

1965St03: ^{159}Tb(^{11}B,6nγ). Measured ce spectra. The ground-state band deduced up to 14^+.

Others (dealing with the measurements of continuum spectra):

1993Th02: ^{100}Mo(^{64}Ni,X) E=232 MeV and ^{148}Sm(^{16}O,X) E=82 MeV. Measured γ-multiplicity, deduced ^{164}Yb excited states built on GDR.

1985In03, 1979In03: ^{159}Tb(^{14}N,5nα) E=95 MeV. Measured average γ-multiplicity.

1984Mo04: ^{166}Er(^{3}He,5n) E=100 MeV. Measured σ(fragment).

1981Hj01: ^{160}Gd(^{12}C,8n) E=118 MeV. Measured average γ-multiplicity.

^{164}Yb Levels

Following levels (from 1986Jo02) are omitted since these are not confirmed in the later work (1995No04): 1498 level (738.0γ), 1967 level (745γ) and 2337 level (1114γ).

Nomenclature of the quasineutron orbitals:

A: ν5/2[642],α=+1/2, $i_{13/2}$ orbital.

B: ν5/2[642],α=−1/2; $i_{13/2}$ orbital.

C: ν3/2[651],α=+1/2; $i_{13/2}$ orbital.

D: ν3/2[651],α=−1/2; $i_{13/2}$ orbital.

E: ν3/2[521],α=+1/2; $h_{9/2}$ orbital.

F: ν3/2[521],α=−1/2; $h_{9/2}$ orbital.

G: ν5/2[523],α=+1/2; $f_{7/2}$ orbital.

H: ν5/2[523],α=+1/2; $f_{7/2}$ orbital.

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0[#]	0^+		
123.59[#] *10*	2^+	0.96 ns *7*	$T_{1/2}$: from ce(t) (1979Ri06). Other: 0.971 ns *31* (1978Ba16). In both recoil-shadow method was used.
385.82[#] *13*	4^+		
760.39[#] *14*	6^+		
1004.05[@] *17*	3^+		
1223.37[#] *15*	8^+		
1347.86[@] *16*	5^+		
1442.38[d] *15*	5^-		
1551.26[b] *13*	4^-		
1565.65[f] *19*	6^+		
1674.53[d] *16*	7^-		
1753.63[#] *16*	10^+		

Continued on next page (footnotes at end of table)

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^{164}Yb Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
1779.84[@] 17	7^+	3753.73[k] 20	(15^+)	5611.33[i] 23	(21^+)	7405.5[a] 4	(26^-)
1798.74[b] 14	6^-	3849.61[b] 18	16^-	5688.7[b] 4	22^-	7495.7[d] 3	27^-
1873.84[f] 16	8^+	3863.39[e] 18	(16^+)	5695.29[j] 23	(21^+)	7645.9[e] 4	(26^+)
1999.97[d] 16	9^-	3932.75[h] 19	18^+	5804.54[g] 21	(22^+)	7786.3[h] 3	28^+
2123.45[b] 15	8^-	3941.86[d] 19	17^-	5865.21[a] 22	(22^-)	7829.6[c] 4	(27^-)
2272.48[@] 18	9^+	4066.20[&] 19	16^-	5907.41[d] 24	23^-	7887.7[i] 5	(27^+)
2284.25[f] 17	(10^+)	4295.72[k] 22	(17^+)	5961.5[e] 3	(22^+)	7970.6[l] 4	(27^-)
2310.65[&] 17	8^-	4391.29[#] 19	18^+	6058.69[h] 23	24^+	7977.7[k] 4	(27^+)
2330.18[#] 17	12^+	4393.78[i] 24	(17^+)	6084.0[&] 4	22^-	8018.8[b] 5	28^-
2401.09[d] 17	11^-	4445.33[b] 20	18^-	6273.5[c] 3	(23^-)	8059.7[j] 4	(27^+)
2483.10[b] 16	10^-	4468.04[j] 24	(17^+)	6308.6[i] 3	(23^+)	8135.4[g] 4	(28^+)
2597.66[&] 16	10^-	4480.11[e] 19	(18^+)	6339.6[k] 3	(23^+)	8265.0[a] 4	(28^-)
2683.77[h] 17	12^+	4552.30[d] 20	19^-	6372.6[b] 4	24^-	8398.1[d] 4	29^-
2795.28[@] 19	11^+	4565.39[h] 20	20^+	6429.02[j] 24	(23^+)	8715.3[c] 5	(29^-)
2824.83[e] 18	(12^+)	4657.70[a] 20	(18^-)	6525.52[g] 23	(24^+)	8724.9[h] 4	30^+
2863.56[d] 17	13^-	4704.09[&] 22	18^-	6606.71[a] 24	(24^-)	8771.2[i] 5	(29^+)
2864.09[b] 17	12^-	4915.79[k] 24	(19^+)	6667.1[d] 3	25^-	8871.3[k] 5	(29^+)
2899.48[#] 18	14^+	4965.69[i] 23	(19^+)	6785.8[e] 4	(24^+)	8971.5[b] 5	30^-
3012.75[&] 17	12^-	5040.03[j] 23	(19^+)	6848.2[&] 4	24^-	8999.4[g] 4	(30^+)
3087.01[h] 17	14^+	5068.11[b] 25	20^-	6897.05[h] 25	26^+	9185.3[a] 5	(30^-)
3293.98[@] 21	13^+	5097.53[g] 20	(20^+)	7011.5[c] 3	(25^-)	9367.9[d] 4	31^-
3305.62[e] 17	(14^+)	5183.15[e] 20	(20^+)	7066.8[i] 4	(25^+)	9645.0[c] 6	(31^-)
3317.42[b] 18	14^-	5197.59[a] 20	(20^-)	7133.8[k] 4	(25^+)	9714.5[h] 4	32^+
3378.11[d] 17	15^-	5206.24[d] 21	21^-	7149.0[b] 4	26^-	9716.7[i] 6	(31^+)
3389.26[h] 18	16^+	5278.17[h] 22	22^+	7201.3[l] 3	(25^-)	9986.1[b] 6	32^-
3504.58[&] 18	14^-	5380.60[&] 24	20^-	7217.9[j] 3	(25^+)	10372.1[d] 5	33^-
3695.90[#] 18	16^+	5597.0[k] 3	(21^+)	7299.9[g] 3	(26^+)	10744.4[h] 6	34^+

† From least-squares fit to Eγ data.
‡ As suggested by 1995No04, parentheses in some cases have been added by evaluators. See also Adopted Levels.
[#] Band(A): g.s. band.
[@] Band(B): γ band.
[&] Band(C): α=0, BE → BEAD.
[a] Band(D): α=0, AHBC → AHBCEF.
[b] Band(E): α=0, AF → AFBC.
[c] Band(F): α=1, AGBC → AGBCEF.
[d] Band(G): α=1, AE → AEBC.
[e] Band(H): α=0, BC and/or AD.
[f] Band(I): α=0, EF.
[g] Band(J): α=0, BCAD.
[h] Band(K): α=0, AB → ABEFCD.
[i] Band(L): α=1, Q1 (ABEG and/or ABFH). weakly populated band.
[j] Band(M): α=1, Q2 (ABEG and/or ABFH). weakly populated band.
[k] Band(N): α=1, Q3 (AC). weakly populated band.
[l] Band(O): α=1, Q4 (BFAD(?)). weakly populated band.

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

$\gamma(^{164}Yb)$

A_2, A_4 and α(K)exp values are from 1986Jo02, unless otherwise stated.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[a]	Comments
123.6 *1*	52.8 *13*	123.59	2^+	0.0	0^+	E2	1.448	A_2=+0.19 *2*; A_4=−0.11 *3* (1972Li34) α(K)=0.616 *9*; α(L)=0.636 *10*; α(M)=0.1561 *23* α(N)=0.0357 *6*; α(O)=0.00414 *6*; α(P)=2.62×10^{-5} *4*
141.1 *2*	0.4 *2*	2824.83	(12^+)	2683.77	12^+			
167.2 *2*	0.2 *1*	3863.39	(16^+)	3695.90	16^+			
180.0 *2*	0.3 *1*	2863.56	13^-	2683.77	12^+			
187.6[‡] *3*	0.2 *1*	2310.65	8^-	2123.45	8^-			
187.6 *1*	0.7 *2*	3087.01	14^+	2899.48	14^+			
218.6 *1*	0.7 *2*	3305.62	(14^+)	3087.01	14^+			
247.5 *1*	1.4 *3*	1798.74	6^-	1551.26	4^-			
262.2 *1*	100.0 *21*	385.82	4^+	123.59	2^+	(E2)	0.1118	A_2=+0.27 *1*; A_4=−0.07 *1* α(K)=0.0767 *11*; α(L)=0.0270 *4*; α(M)=0.00646 *9* α(N)=0.001487 *21*; α(O)=0.000184 *3*; α(P)=3.81×10^{-6} *6* A_2=+0.29 *1*; A_4=−0.03 *2* (1972Li34)
266.3 *2*	0.3 *1*	2864.09	12^-	2597.66	10^-			
286.9 *1*	0.6 *2*	2597.66	10^-	2310.65	8^-			
291.1 *1*	1.5 *3*	3378.11	15^-	3087.01	14^+	D+Q		A_2=−0.28 *2*; A_4=+0.22 *9*
302.3 *1*	0.8 *2*	3389.26	16^+	3087.01	14^+			
306.6 *1*	0.6 *2*	3695.90	16^+	3389.26	16^+			
308.2 *2*	0.3 *1*	1873.84	8^+	1565.65	6^+			
324.8 *1*	4.5 *3*	2123.45	8^-	1798.74	6^-	(E2)		A_2=+0.31 *2*; A_4=−0.11 *2*
325.7 *2*	0.5 *2*	1999.97	9^-	1674.53	7^-			
344.1 *2*	0.5 *2*	1347.86	5^+	1004.05	3^+			
353.5 *1*	1.8 *3*	2683.77	12^+	2330.18	12^+			A_2=+0.24 *5*; A_4=+0.03 *5*
356.3 *1*	1.2 *3*	1798.74	6^-	1442.38	5^-			A_2=+0.33 *5*; A_4=+0.09 *5*
359.7 *1*	6.1 *3*	2483.10	10^-	2123.45	8^-	E2	0.0434	A_2=+0.31 *2*; A_4=−0.06 *2*; α(K)exp=0.035 *8* α(K)=0.0323 *5*; α(L)=0.00854 *12*; α(M)=0.00201 *3* α(N)=0.000464 *7*; α(O)=5.95×10^{-5} *9*; α(P)=1.703×10^{-6} *24*
374.6 *1*	92.5 *19*	760.39	6^+	385.82	4^+	(E2)	0.0387	A_2=+0.28 *1*; A_4=−0.08 *1* α(K)=0.0290 *4*; α(L)=0.00743 *11*; α(M)=0.001744 *25* α(N)=0.000403 *6*; α(O)=5.19×10^{-5} *8*; α(P)=1.540×10^{-6} *22* A_2=+0.30 *2*; A_4=−0.05 *2* (1972Li34)
381.0 *1*	6.9 *3*	2864.09	12^-	2483.10	10^-			A_2=+0.31 *4*; A_4=−0.05 *4*
399.4 *1*	0.7 *2*	2683.77	12^+	2284.25	(10^+)			
401.1 *1*	4.0 *3*	2401.09	11^-	1999.97	9^-			A_2=+0.21 *4*; A_4=+0.03 *4*
403.1 *1*	1.1 *2*	3087.01	14^+	2683.77	12^+			A_2=+0.34 *14*; A_4=+0.03 *13*
410.3 *1*	1.2 *3*	2284.25	(10^+)	1873.84	8^+			
415.0 *1*	2.4 *3*	3012.75	12^-	2597.66	10^-			A_2=+0.30 *6*; A_4=−0.04 *6*
431.9 *1*	0.9 *3*	1779.84	7^+	1347.86	5^+			

$^{164}_{70}Yb_{94}$-3

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

$\gamma(^{164}Yb)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[a]	Comments
448.9 *1*	2.1 *3*	2123.45	8^-	1674.53	7^-	D+Q			A_2=+0.59 *8*; A_4=+0.23 *7*
451.1 *2*	0.6 *2*	1798.74	6^-	1347.86	5^+				
453.2 *1*	8.0 *3*	3317.42	14^-	2864.09	12^-				A_2=+0.24 *2*; A_4=−0.05 *2* A_2, A_4 for a triplet.
454.4 *2*	1.0 *3*	3317.42	14^-	2863.56	13^-				
462.4 *1*	12.4 *3*	2863.56	13^-	2401.09	11^-				
463.1 *1*	91.9 *19*	1223.37	8^+	760.39	6^+	(E2)		0.0217	A_2=+0.30 *1*; A_4=−0.07 *1* α(K)=0.01692 *24*; α(L)=0.00373 *6*; α(M)=0.000865 *13* α(N)=0.000201 *3*; α(O)=2.64×10^{-5} *4*; α(P)=9.21×10^{-7} *13* A_2=+0.30 *2*; A_4=−0.08 *3* (1972Li34) A_2, A_4 for a triplet near 463.
463.2 *3*	1.8 *3*	2864.09	12^-	2401.09	11^-				
471.4 *1*	0.7 *2*	3849.61	16^-	3378.11	15^-				
474.2 *1*	2.5 *3*	2597.66	10^-	2123.45	8^-				
474.6 *2*	0.4 *2*	3863.39	(16^+)	3389.26	16^+				
480.8 *1*	1.8 *3*	3305.62	(14^+)	2824.83	(12^+)				
483.2 *1*	3.0 *3*	2483.10	10^-	1999.97	9^-	(M1+E2)[#]	+0.74 *+6−5*	0.0358 *11*	A_2=+0.47 *5*; A_4=+0.18 *5* α(K)=0.0297 *10*; α(L)=0.00475 *11*; α(M)=0.001069 *23* α(N)=0.000250 *6*; α(O)=3.52×10^{-5} *9*; α(P)=1.75×10^{-6} *6*
489.8 *1*	27.2 *6*	3389.26	16^+	2899.48	14^+	(E2)		0.0188	A_2=+0.30 *1*; A_4=−0.08 *1* α(K)=0.01475 *21*; α(L)=0.00314 *5*; α(M)=0.000726 *11* α(N)=0.0001686 *24*; α(O)=2.23×10^{-5} *4*; α(P)=8.07×10^{-7} *12* A_2=+0.33 *5*; A_4=−0.03 *7* (1972Li34)
491.8 *1*	4.1 *3*	3504.58	14^-	3012.75	12^-				
492.6 *1*	1.6 *3*	2272.48	9^+	1779.84	7^+				
498.7 *1*	1.3 *3*	3293.98	13^+	2795.28	11^+				
511.5[‡] *2*	1.2 *3*	2310.65	8^-	1798.74	6^-				
514.5 *1*	14.6 *3*	3378.11	15^-	2863.56	13^-	(E2)			A_2=+0.26 *2*; A_4=−0.12 *2*
522.8 *1*	2.4 *3*	2795.28	11^+	2272.48	9^+				
529.7[‡] *1*	2.8 *3*	3012.75	12^-	2483.10	10^-				
530.4 *1*	76.7 *16*	1753.63	10^+	1223.37	8^+	(E2)		0.01537	A_2=+0.31 *1*; A_4=−0.08 *1* α(K)=0.01218 *17*; α(L)=0.00247 *4*; α(M)=0.000570 *8* α(N)=0.0001325 *19*; α(O)=1.769×10^{-5} *25*; α(P)=6.71×10^{-7} *10* A_2=+0.39 *2*; A_4=−0.06 *3* (1972Li34)
532.2 *1*	8.4 *3*	3849.61	16^-	3317.42	14^-				A_2=−0.08 *4*; A_4=−0.08 *4* A_2, A_4 for a doublet.
533.5 *1*	7.0 *3*	2863.56	13^-	2330.18	12^+				A_2=−0.08 *4*; A_4=−0.08 *4* A_2, A_4 for a doublet.
540.0 *1*	1.1 *3*	5197.59	(20^-)	4657.70	(18^-)				
540.6 *1*	1.6 *3*	2824.83	(12^+)	2284.25	(10^+)				
541.4 *2*	0.8 *2*	4295.72	(17^+)	3753.73	(15^+)				
543.3 *1*	21.3 *5*	3932.75	18^+	3389.26	16^+	(E2)		0.01448	A_2=+0.29 *1*; A_4=−0.11 *1*

$^{164}_{70}Yb_{94}$-4

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

$\gamma(^{164}Yb)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[a]	Comments
									α(K)=0.01151 *17*; α(L)=0.00231 *4*; α(M)=0.000531 *8* α(N)=0.0001234 *18*; α(O)=1.652×10^{-5} *24*; α(P)=6.35×10^{-7} *9*
547.0 *2*	0.5 *2*	1551.26	4$^-$	1004.05	3$^+$				
552.2 *2*	0.7 *2*	3941.86	17$^-$	3389.26	16$^+$				
557.8 *1*	3.2 *3*	3863.39	(16$^+$)	3305.62	(14$^+$)				
561.7 *1*	3.7 *3*	4066.20	16$^-$	3504.58	14$^-$				
563.8 *1*	11.2 *3*	3941.86	17$^-$	3378.11	15$^-$				
569.4 *1*	38.4 *8*	2899.48	14$^+$	2330.18	12$^+$	(E2)		0.01291	A$_2$=+0.32 *1*; A$_4$=−0.08 *1* α(K)=0.01031 *15*; α(L)=0.00202 *3*; α(M)=0.000463 *7* α(N)=0.0001077 *15*; α(O)=1.447×10^{-5} *21*; α(P)=5.71×10^{-7} *8* A$_2$=+0.22 *2*; A$_4$=−0.03 *4* (1972Li34)
572.3 *2*	0.9 *3*	4965.69	(19$^+$)	4393.78	(17$^+$)				
572.4 *2*	0.4 *2*	5040.03	(19$^+$)	4468.04	(17$^+$)				
576.7 *1*	56.1 *12*	2330.18	12$^+$	1753.63	10$^+$	(E2)		0.01252	A$_2$=+0.29 *1*; A$_4$=−0.09 *1* α(K)=0.01001 *14*; α(L)=0.00194 *3*; α(M)=0.000446 *7* α(N)=0.0001038 *15*; α(O)=1.397×10^{-5} *20*; α(P)=5.55×10^{-7} *8* A$_2$=+0.35 *4*; A$_4$=0.00 *6* (1972Li34)
591.6 *1*	1.3 *3*	4657.70	(18$^-$)	4066.20	16$^-$	&			δ: ≈0.5 for ΔJ=1.
595.6 *1*	7.3 *3*	4445.33	18$^-$	3849.61	16$^-$				
608.8 *1*	5.1 *3*	3695.90	16$^+$	3087.01	14$^+$	(E2)		0.01100	A$_2$=+0.27 *6*; A$_4$=−0.14 *6*; α(K)exp=0.0073 *20* α(K)=0.00884 *13*; α(L)=0.001671 *24*; α(M)=0.000383 *6* α(N)=8.91×10^{-5} *13*; α(O)=1.204×10^{-5} *17*; α(P)=4.92×10^{-7} *7* α(K)exp for a doublet.
610.4 *1*	8.4 *3*	4552.30	19$^-$	3941.86	17$^-$	(E2)		0.01093	α(K)exp=0.0073 *20* α(K)=0.00879 *13*; α(L)=0.001659 *24*; α(M)=0.000380 *6* α(N)=8.84×10^{-5} *13*; α(O)=1.196×10^{-5} *17*; α(P)=4.89×10^{-7} *7* α(K)exp for a doublet.
616.7 *2*	2.5 *3*	4480.11	(18$^+$)	3863.39	(16$^+$)				
618.8 *2*	0.8 *2*	5097.53	(20$^+$)	4480.11	(18$^+$)				E_γ: poor fit in level scheme. Level energy difference=617.42.
619.6 *2*	1.1 *3*	4552.30	19$^-$	3932.75	18$^+$	(E1(+M2))[#]	+0.2 *2*		
619.8 *2*	1.0 *3*	4915.79	(19$^+$)	4295.72	(17$^+$)				
620.6 *2*	2.7 *3*	5688.7	22$^-$	5068.11	20$^-$	(E2)		0.01051	α(K)exp=0.0086 *10* α(K)=0.00847 *12*; α(L)=0.001585 *23*; α(M)=0.000363 *5* α(N)=8.45×10^{-5} *12*; α(O)=1.144×10^{-5} *16*; α(P)=4.71×10^{-7} *7* α(K)exp for a doublet.
621.8 *1*	2.3 *3*	3305.62	(14$^+$)	2683.77	12$^+$				
622.5 *2*	4.5 *3*	5068.11	20$^-$	4445.33	18$^-$	(E2)		0.01043	α(K)exp=0.0086 *10* α(K)=0.00841 *12*; α(L)=0.001572 *22*; α(M)=0.000360 *5* α(N)=8.37×10^{-5} *12*; α(O)=1.134×10^{-5} *16*; α(P)=4.68×10^{-7} *7* α(K)exp for a doublet.
632.4 *1*	14.2 *3*	4565.39	20$^+$	3932.75	18$^+$	Q			A$_2$=+0.31 *4*; A$_4$=−0.13 *4*
635.4[‡] *3*	0.3 *1*	2310.65	8$^-$	1674.53	7$^-$				

$^{164}_{70}Yb_{94}$-5

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

$\gamma(^{164}Yb)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[a]	Comments
637.9 *1*	1.7 *3*	4704.09	18^-	4066.20	16^-				
641.0[‡] *2*	0.6 *2*	3504.58	14^-	2864.09	12^-				
641.0 *2*	1.0 *3*	5206.24	21^-	4565.39	20^+	D(+Q)[#]	−0.04 *4*		
645.7 *1*	1.2 *3*	5611.33	(21^+)	4965.69	(19^+)				
647.4 *1*	13.4 *3*	2401.09	11^-	1753.63	10^+	E1(+M2)[#]	+0.016 *26*	0.00351 *10*	A_2=−0.17 *1*; A_4=−0.04 *1*; α(K)exp<0.0042 α(K)=0.00298 *9*; α(L)=0.000418 *14*; α(M)=9.3×10^{-5} *3* α(N)=2.17×10^{-5} *7*; α(O)=3.06×10^{-6} *10*; α(P)=1.59×10^{-7} *6*
650.4 *1*	2.1 *3*	1873.84	8^+	1223.37	8^+				
653.9 *1*	5.5 *3*	5206.24	21^-	4552.30	19^-	Q			A_2=+0.42 *8*; A_4=−0.19 *8*
655.8 *2*	0.4 *2*	5695.29	(21^+)	5040.03	(19^+)				
667.7 *1*	1.5 *3*	5865.21	(22^-)	5197.59	(20^-)				
676.5 *1*	1.4 *3*	5380.60	20^-	4704.09	18^-				
681.2 *1*	1.4 *3*	5597.0	(21^+)	4915.79	(19^+)				
683.9 *1*	2.0 *3*	6372.6	24^-	5688.7	22^-				
695.4 *1*	4.9 *3*	4391.29	18^+	3695.90	16^+	E2		0.00808	α(K)exp=0.0050 *15* α(K)=0.00657 *10*; α(L)=0.001170 *17*; α(M)=0.000266 *4* α(N)=6.21×10^{-5} *9*; α(O)=8.49×10^{-6} *12*; α(P)=3.68×10^{-7} *6*
697.3 *2*	0.9 *3*	6308.6	(23^+)	5611.33	(21^+)				
701.1 *1*	3.7 *3*	5907.41	23^-	5206.24	21^-	(E2)		0.00793	α(K)exp=0.0055 *15* α(K)=0.00646 *9*; α(L)=0.001145 *16*; α(M)=0.000261 *4* α(N)=6.08×10^{-5} *9*; α(O)=8.31×10^{-6} *12*; α(P)=3.61×10^{-7} *5* α(K)exp for a doublet.
702.8 *1*	1.8 *3*	5183.15	(20^+)	4480.11	(18^+)				
703.4 *2*	0.5 *2*	6084.0	22^-	5380.60	20^-	(E2)		0.00787	α(K)exp=0.0055 *15* α(K)=0.00641 *9*; α(L)=0.001136 *16*; α(M)=0.000259 *4* α(N)=6.03×10^{-5} *9*; α(O)=8.24×10^{-6} *12*; α(P)=3.59×10^{-7} *5* α(K)exp for a doublet.
706.0 *1*	2.5 *3*	5097.53	(20^+)	4391.29	18^+	(E2)		0.00781	α(K)exp=0.0067 *15* α(K)=0.00636 *9*; α(L)=0.001125 *16*; α(M)=0.000256 *4* α(N)=5.97×10^{-5} *9*; α(O)=8.17×10^{-6} *12*; α(P)=3.56×10^{-7} *5* α(K)exp for a doublet.
707.1 *1*	1.8 *3*	5804.54	(22^+)	5097.53	(20^+)	(E2)		0.00778	α(K)exp=0.0067 *15* α(K)=0.00634 *9*; α(L)=0.001120 *16*; α(M)=0.000255 *4* α(N)=5.94×10^{-5} *9*; α(O)=8.13×10^{-6} *12*; α(P)=3.55×10^{-7} *5* α(K)exp for a doublet.
712.8 *1*	8.3 *3*	5278.17	22^+	4565.39	20^+				
720.9 *1*	1.4 *3*	6525.52	(24^+)	5804.54	(22^+)				
729.4 *1*	1.8 *3*	2483.10	10^-	1753.63	10^+				
733.8 *1*	0.8 *3*	6429.02	(23^+)	5695.29	(21^+)				
738.2 *2*	0.9 *3*	7011.5	(25^-)	6273.5	(23^-)				
741.5 *1*	1.3 *3*	6606.71	(24^-)	5865.21	(22^-)				
742.6 *1*	1.0 *3*	6339.6	(23^+)	5597.0	(21^+)				

$^{164}_{70}Yb_{94}$-6

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

γ(^{164}Yb) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[a]	Comments
752.2 *1*	1.5 *3*	5197.59	(20$^-$)	4445.33	18$^-$	[&]			δ: ≈0.5 for ΔJ=1.
756.8 *1*	7.2 *3*	3087.01	14$^+$	2330.18	12$^+$	E2		0.00669	A_2=+0.27 *3*; A_4=−0.02 *2*; α(K)exp=0.0046 *15* α(K)=0.00548 *8*; α(L)=0.000943 *14*; α(M)=0.000214 *3* α(N)=4.99×10^{-5} *7*; α(O)=6.86×10^{-6} *10*; α(P)=3.07×10^{-7} *5*
758.2 *2*	0.5 *2*	7066.8	(25$^+$)	6308.6	(23$^+$)				
759.7 *1*	1.9 *3*	6667.1	25$^-$	5907.41	23$^-$				
764.2 *2*	0.6 *2*	6848.2	24$^-$	6084.0	22$^-$				
769.2 *2*	3.4 *3*	7970.6	(27$^-$)	7201.3	(25$^-$)				
774.0 *2*	0.8 *2*	7299.9	(26$^+$)	6525.52	(24$^+$)				
776.2 *2*	1.1 *3*	3863.39	(16$^+$)	3087.01	14$^+$				
776.4 *2*	1.0 *3*	7149.0	26$^-$	6372.6	24$^-$				
776.6 *1*	7.9 *3*	1999.97	9$^-$	1223.37	8$^+$	E1(+M2)[#]	+0.082 *15*	0.00265 *10*	A_2=−0.20 *1*; A_4=+0.02 *2*; α(K)exp=0.0018 *6* α(K)=0.00224 *8*; α(L)=0.000316 *13*; α(M)=7.0×10^{-5} *3* α(N)=1.64×10^{-5} *7*; α(O)=2.33×10^{-6} *10*; α(P)=1.22×10^{-7} *5*
778.3 *2*	0.8 *2*	5961.5	(22$^+$)	5183.15	(20$^+$)				
780.6 *1*	4.6 *3*	6058.69	24$^+$	5278.17	22$^+$	(E2)		0.00625	A_2=+0.26 *7*; A_4=−0.06 *7*; α(K)exp>0.0033 α(K)=0.00513 *8*; α(L)=0.000872 *13*; α(M)=0.000198 *3* α(N)=4.62×10^{-5} *7*; α(O)=6.36×10^{-6} *9*; α(P)=2.88×10^{-7} *4*
784.3 *1*	1.9 *3*	4480.11	(18$^+$)	3695.90	16$^+$				
788.9 *2*	0.4 *2*	7217.9	(25$^+$)	6429.02	(23$^+$)				
792.1 *1*	1.7 *3*	5183.15	(20$^+$)	4391.29	18$^+$				
794.2 *2*	0.5 *2*	7133.8	(25$^+$)	6339.6	(23$^+$)				
796.6 *1*	5.2 *3*	3695.90	16$^+$	2899.48	14$^+$	(E2)		0.00598	A_2=+0.41 *4*; A_4=−0.09 *4*; α(K)exp>0.0037 α(K)=0.00491 *7*; α(L)=0.000830 *12*; α(M)=0.000188 *3* α(N)=4.39×10^{-5} *7*; α(O)=6.05×10^{-6} *9*; α(P)=2.76×10^{-7} *4*
796.8 *2*	0.5 *2*	5865.21	(22$^-$)	5068.11	20$^-$				
798.8 *2*	0.6 *2*	7405.5	(26$^-$)	6606.71	(24$^-$)				
805.1 *2*	0.9 *3*	1565.65	6$^+$	760.39	6$^+$				
808.2 *2*	0.5 *2*	4657.70	(18$^-$)	3849.61	16$^-$				
818.1 *2*	0.5 *2*	7829.6	(27$^-$)	7011.5	(25$^-$)				
820.9 *2*	0.4 *2*	7887.7	(27$^+$)	7066.8	(25$^+$)				
824.3 *2*	0.6 *2*	6785.8	(24$^+$)	5961.5	(22$^+$)				
828.6 *1*	1.2 *3*	7495.7	27$^-$	6667.1	25$^-$				
835.5 *2*	0.7 *2*	8135.4	(28$^+$)	7299.9	(26$^+$)				
838.4 *1*	2.7 *3*	6897.05	26$^+$	6058.69	24$^+$				
841.8 *2*	0.5 *2*	8059.7	(27$^+$)	7217.9	(25$^+$)				
843.9 *2*	0.5 *2*	7977.7	(27$^+$)	7133.8	(25$^+$)				
854.1 *1*	1.4 *3*	3753.73	(15$^+$)	2899.48	14$^+$				
859.5 *2*	0.4 *2*	8265.0	(28$^-$)	7405.5	(26$^-$)				
860.1 *2*	0.3 *1*	7645.9	(26$^+$)	6785.8	(24$^+$)				
864.0 *2*	0.3 *1*	8999.4	(30$^+$)	8135.4	(28$^+$)				
869.8 *2*	0.5 *2*	8018.8	28$^-$	7149.0	26$^-$				

$^{164}_{70}Yb_{94}$-7

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

γ(^{164}Yb) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[a]	Comments
880.5 *2*	1.4 *3*	1004.05	3^+	123.59	2^+			
883.5 *2*	0.2 *1*	8771.2	(29^+)	7887.7	(27^+)			
885.7 *3*	0.3 *1*	8715.3	(29^-)	7829.6	(27^-)			
889.2 *1*	1.1 *3*	7786.3	28^+	6897.05	26^+			
893.6 *2*	0.2 *1*	8871.3	(29^+)	7977.7	(27^+)			
900.1 *1*	2.1 *3*	2123.45	8^-	1223.37	8^+	E1	0.00182	A_2=+0.34 *6*; A_4=+0.02 *6*; α(K)exp<0.003 α(K)=0.001550 *22*; α(L)=0.000214 *3*; α(M)=4.72×10^{-5} *7* α(N)=1.105×10^{-5} *16*; α(O)=1.573×10^{-6} *22*; α(P)=8.34×10^{-8} *12*
902.4 *2*	0.5 *2*	8398.1	29^-	7495.7	27^-			
906.8 *2*	0.9 *3*	4295.72	(17^+)	3389.26	16^+			
914.1 *1*	3.3 *3*	1674.53	7^-	760.39	6^+	E1	1.77×10^{-3}	A_2=−0.46 *8*; A_4=+0.08 *7*; α(K)exp<0.0025 α(K)=0.001506 *21*; α(L)=0.000207 *3*; α(M)=4.58×10^{-5} *7* α(N)=1.073×10^{-5} *15*; α(O)=1.527×10^{-6} *22*; α(P)=8.10×10^{-8} *12*
920.3 *3*	0.2 *1*	9185.3	(30^-)	8265.0	(28^-)			
929.7 *3*	0.05 *4*	9645.0	(31^-)	8715.3	(29^-)			
930.2 *1*	2.4 *3*	2683.77	12^+	1753.63	10^+	E2	0.00430	A_2=+0.30 *4*; A_4=0.00 *4*; α(K)exp=0.0045 *8* α(K)=0.00357 *5*; α(L)=0.000573 *8*; α(M)=0.0001292 *18* α(N)=3.02×10^{-5} *5*; α(O)=4.21×10^{-6} *6*; α(P)=2.01×10^{-7} *3*
938.6 *2*	0.5 *2*	8724.9	30^+	7786.3	28^+			
945.5 *3*	0.10 *7*	9716.7	(31^+)	8771.2	(29^+)			
952.7 *2*	0.2 *1*	8971.5	30^-	8018.8	28^-			
961.7 *2*	1.6 *3*	1347.86	5^+	385.82	4^+	M1+E2[@]	0.0059 *20*	α(K)=0.0050 *17*; α(L)=0.00075 *22*; α(M)=0.00017 *5* α(N)=3.9×10^{-5} *12*; α(O)=5.6×10^{-6} *17*; α(P)=2.9×10^{-7} *11* A_2=−0.18 *4*; A_4=+0.03 *4*; α(K)exp=0.0042 *8* δ: +0.18 *5* or +11 *+12−4*.
963.8 *2*	0.4 *2*	3863.39	(16^+)	2899.48	14^+			
969.8 *2*	0.2 *1*	9367.9	31^-	8398.1	29^-			
975.7 *2*	0.6 *2*	3305.62	(14^+)	2330.18	12^+			
983.3 *2*	0.4 *2*	4915.79	(19^+)	3932.75	18^+			
989.6 *2*	0.02 *1*	9714.5	32^+	8724.9	30^+			
1002.0 *2*	0.8 *2*	4391.29	18^+	3389.26	16^+			
1004.2 *3*	0.07 *6*	10372.1	33^-	9367.9	31^-			
1004.9 *2*	0.8 *2*	4393.78	(17^+)	3389.26	16^+			
1014.6 *2*	0.2 *1*	9986.1	32^-	8971.5	30^-			
1019.6 *2*	1.5 *3*	1779.84	7^+	760.39	6^+	(M1+E2)[@]		δ: +0.03 *3* or≤−17.
1029.9 *4*	0.10 *5*	10744.4	34^+	9714.5	32^+			
1032.8 *2*	0.7 *2*	4965.69	(19^+)	3932.75	18^+			
1038.3 *1*	2.4 *3*	1798.74	6^-	760.39	6^+			A_2=+0.51 *10*; A_4=+0.05 *9*
1041.6 *2*	1.0 *3*	2795.28	11^+	1753.63	10^+	(M1+E2)[@]	0.0049 *16*	α(K)=0.0042 *14*; α(L)=0.00062 *18*; α(M)=0.00014 *4* α(N)=3.2×10^{-5} *9*; α(O)=4.6×10^{-6} *14*; α(P)=2.4×10^{-7} *9* δ: −0.06 *6* or≤−7.
1045.7 *2*	0.3 *1*	5611.33	(21^+)	4565.39	20^+			

$^{164}_{70}Yb_{94}$-8

^{152}Sm(^{16}O,4nγ) 1995No04 (continued)

$\gamma(^{164}Yb)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[a]	Comments
1049.3 *2*	1.4 *3*	2272.48	9^+	1223.37	8^+	(M1+E2)[#]	0.0049 *15*	α(K)=0.0041 *13*; α(L)=0.00060 *17*; α(M)=0.00013 *4* α(N)=3.2×10^{-5} *9*; α(O)=4.5×10^{-6} *13*; α(P)=2.4×10^{-7} *8* δ: −0.11 *4* or +8 *+3−5*.
1056.5 *1*	1.6 *3*	1442.38	5^-	385.82	4^+	D		A_2=−0.31 *6*; A_4=+0.07 *6*
1060.8 *2*	1.4 *3*	2284.25	(10^+)	1223.37	8^+			
1067.5 *2*	0.7 *2*	6273.5	(23^-)	5206.24	21^-			
1073.8 *3*	3.3 *3*	7970.6	(27^-)	6897.05	26^+			
1079.2 *2*	0.6 *2*	4468.04	(17^+)	3389.26	16^+			
1087.5[‡] *3*	0.6 *2*	2310.65	8^-	1223.37	8^+			
1103.5 *3*	0.2 *1*	7011.5	(25^-)	5907.41	23^-			
1107.4 *2*	0.6 *2*	5040.03	(19^+)	3932.75	18^+			
1113.3 *2*	1.1 *3*	1873.84	8^+	760.39	6^+			
1129.6 *2*	0.5 *2*	5695.29	(21^+)	4565.39	20^+			
1142.5 *2*	2.2 *3*	7201.3	(25^-)	6058.69	24^+			
1150.6 *2*	0.3 *1*	6429.02	(23^+)	5278.17	22^+			
1165.5 *1*	1.0 *3*	1551.26	4^-	385.82	4^+			
1180.2 *3*	0.9 *3*	1565.65	6^+	385.82	4^+			
1238.4 *2*	0.7 *2*	5804.54	(22^+)	4565.39	20^+			E_γ: poor fit in level scheme. Level energy difference=1239.14.
1241.9 *3*	0.3 *1*	7299.9	(26^+)	6058.69	24^+			
1247.4 *3*	0.4 *2*	6525.52	(24^+)	5278.17	22^+			
1413.0 *10*	0.3 *1*	1798.74	6^-	385.82	4^+			This transition to 4^+ implies mult=M2.
1427.7 *1*	0.05 *4*	1551.26	4^-	123.59	2^+			

[†] From $\gamma(\theta)$, $\gamma\gamma(\theta)$ and ce data.
[‡] J^π assignments in column 2 of table 1 (1995No04) are quoted incorrectly.
[#] ΔJ=1 transition, ΔJ=0 or 2 excluded.
[@] ΔJ=0,1 transition, ΔJ=2 excluded.
[&] ΔJ=0,1,2 transition.
[a] Additional information 1.

$^{164}_{70}Yb_{94}$-9

^{152}Sm(^{16}O,4nγ) 1995No04

Level Scheme

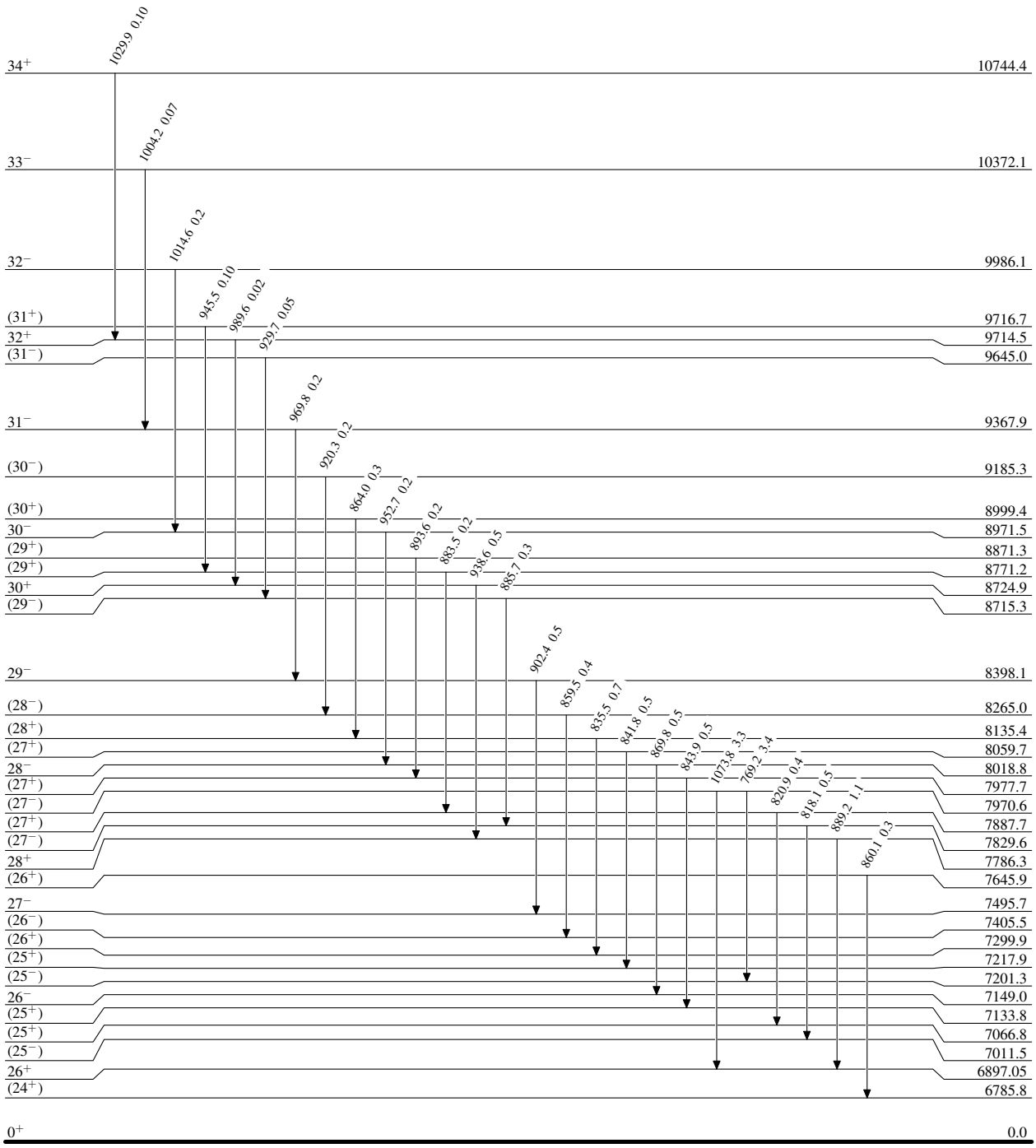
Intensities: Relative I_γ

Legend

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

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

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

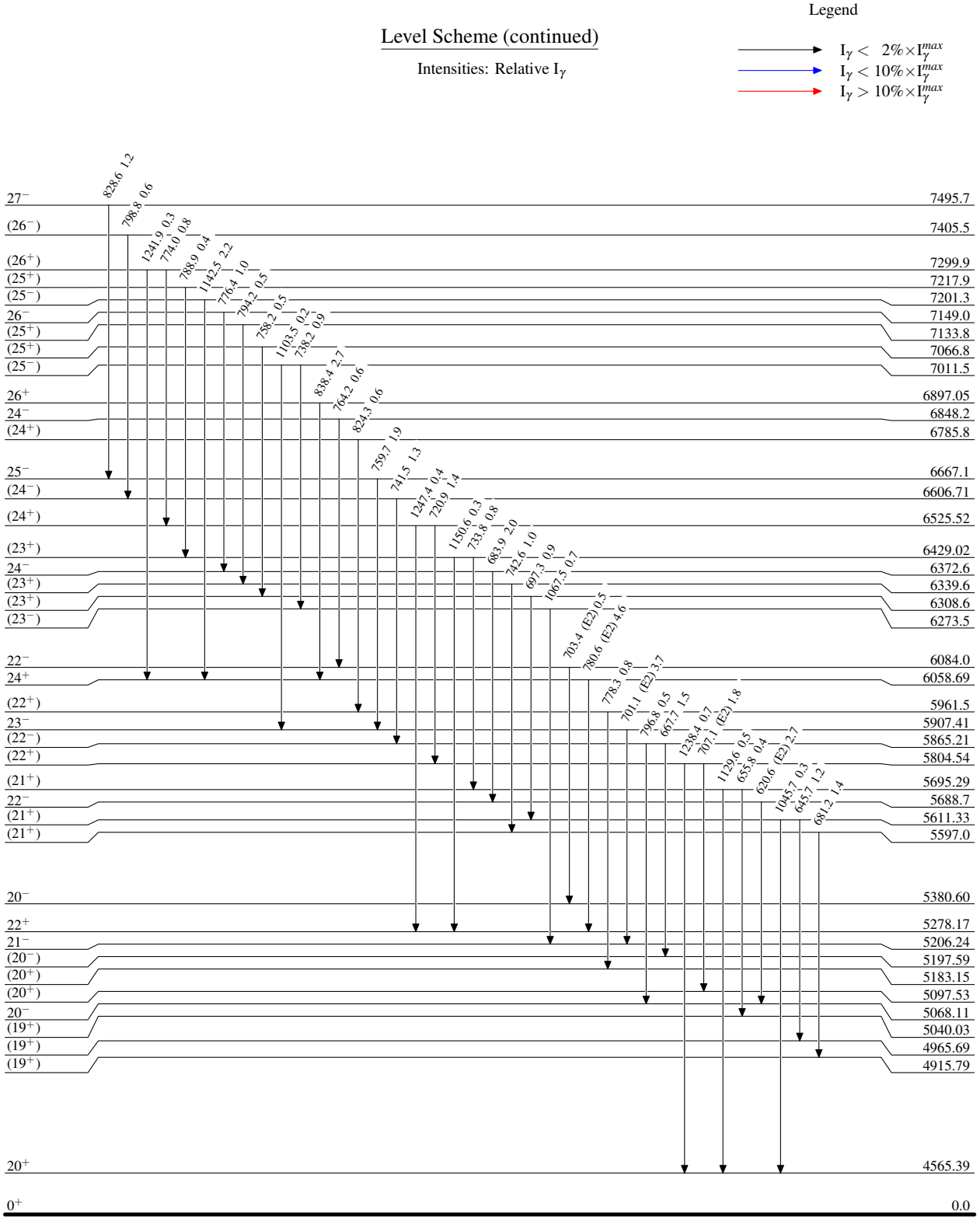


$^{164}_{70}Yb_{94}$

$^{152}Sm(^{16}O,4n\gamma)$ 1995No04

Level Scheme (continued)

Intensities: Relative I_γ



$^{164}_{70}Yb_{94}$

^{152}Sm(^{16}O,4nγ) 1995No04

Level Scheme (continued)

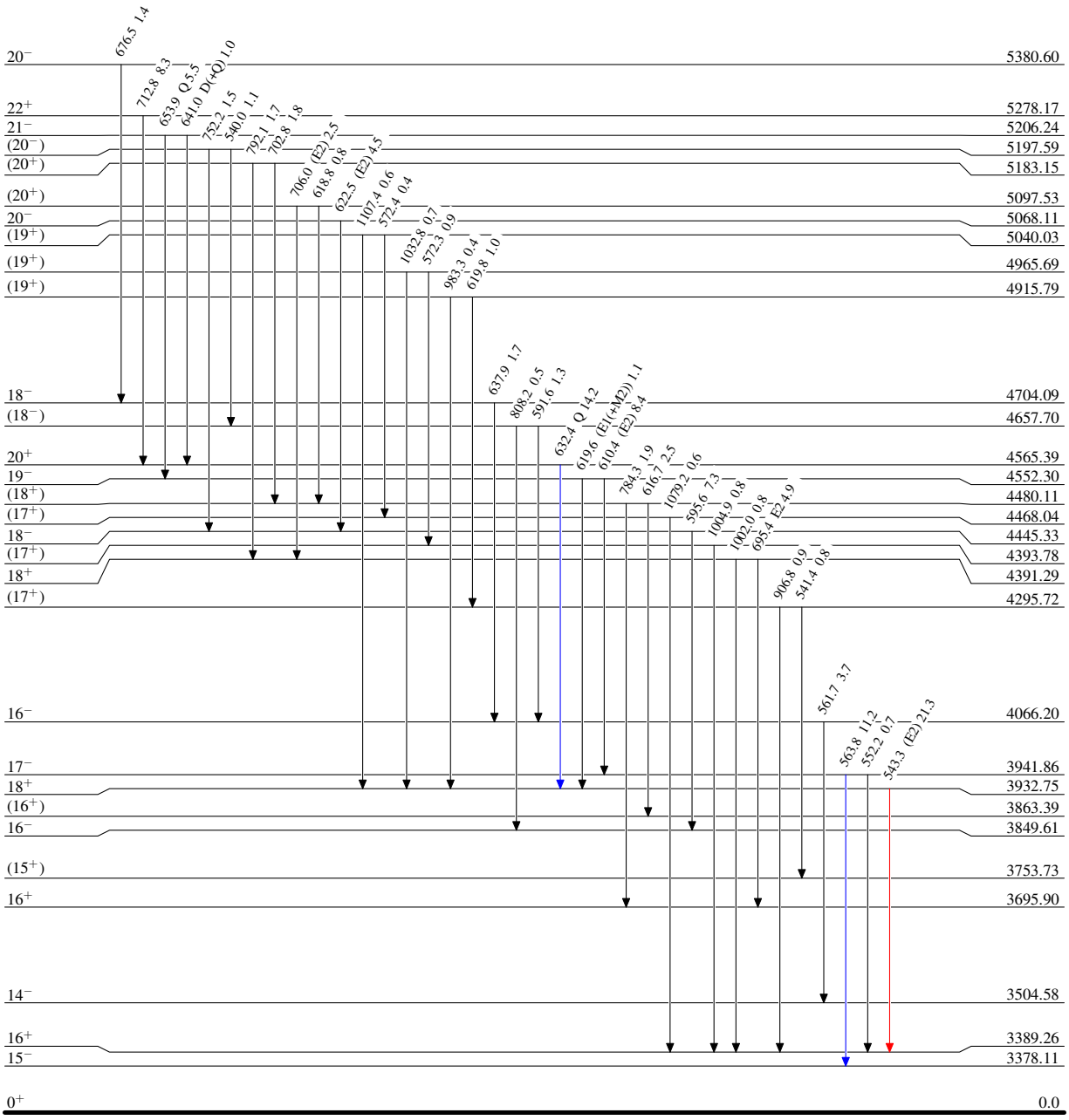
Intensities: Relative I_γ

Legend

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

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

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



$^{164}_{70}Yb_{94}$

^{152}Sm(^{16}O,4nγ) 1995No04

Level Scheme (continued)

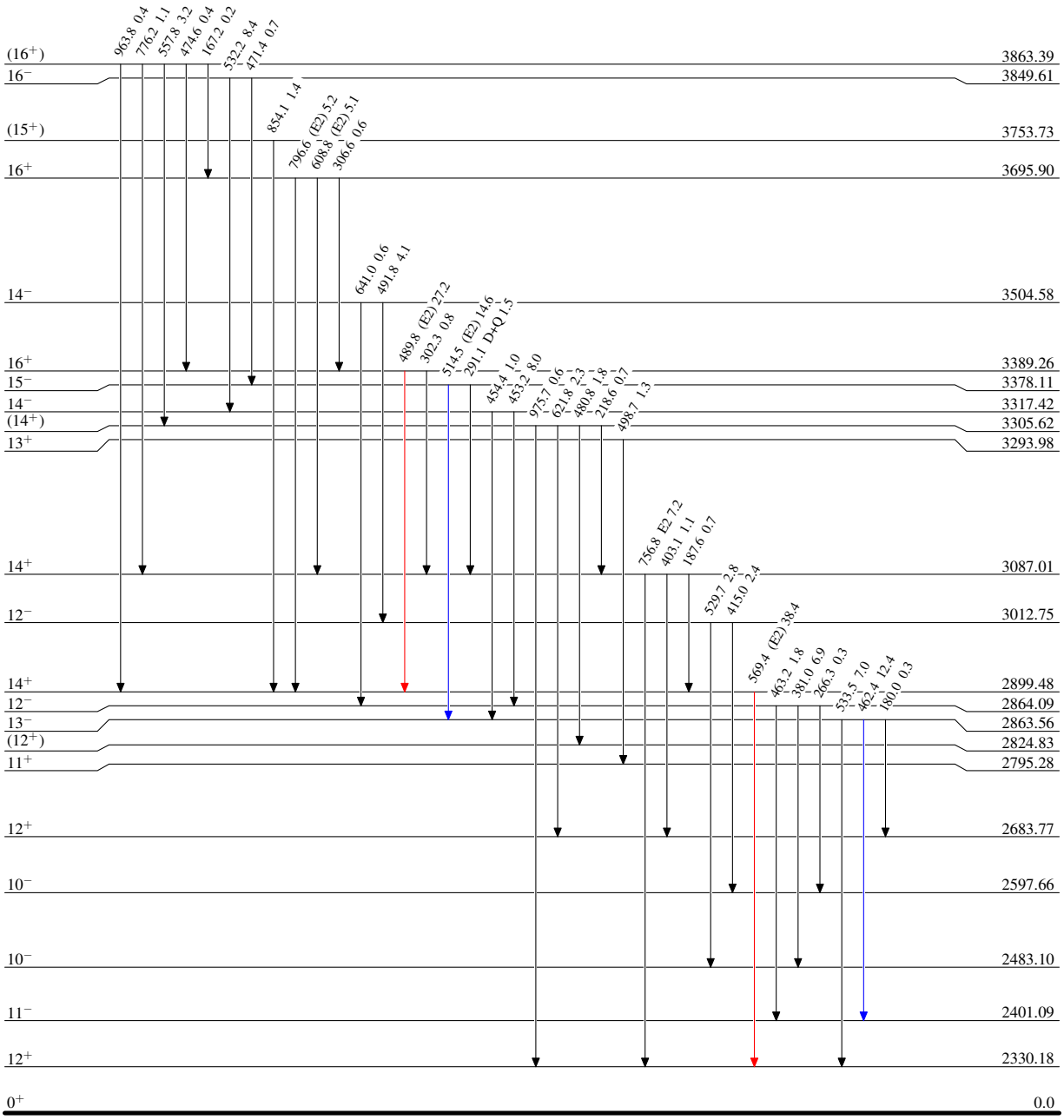
Intensities: Relative I_γ

Legend

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

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

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



$^{164}_{70}Yb_{94}$

^{152}Sm(^{16}O,4nγ) 1995No04

Level Scheme (continued)

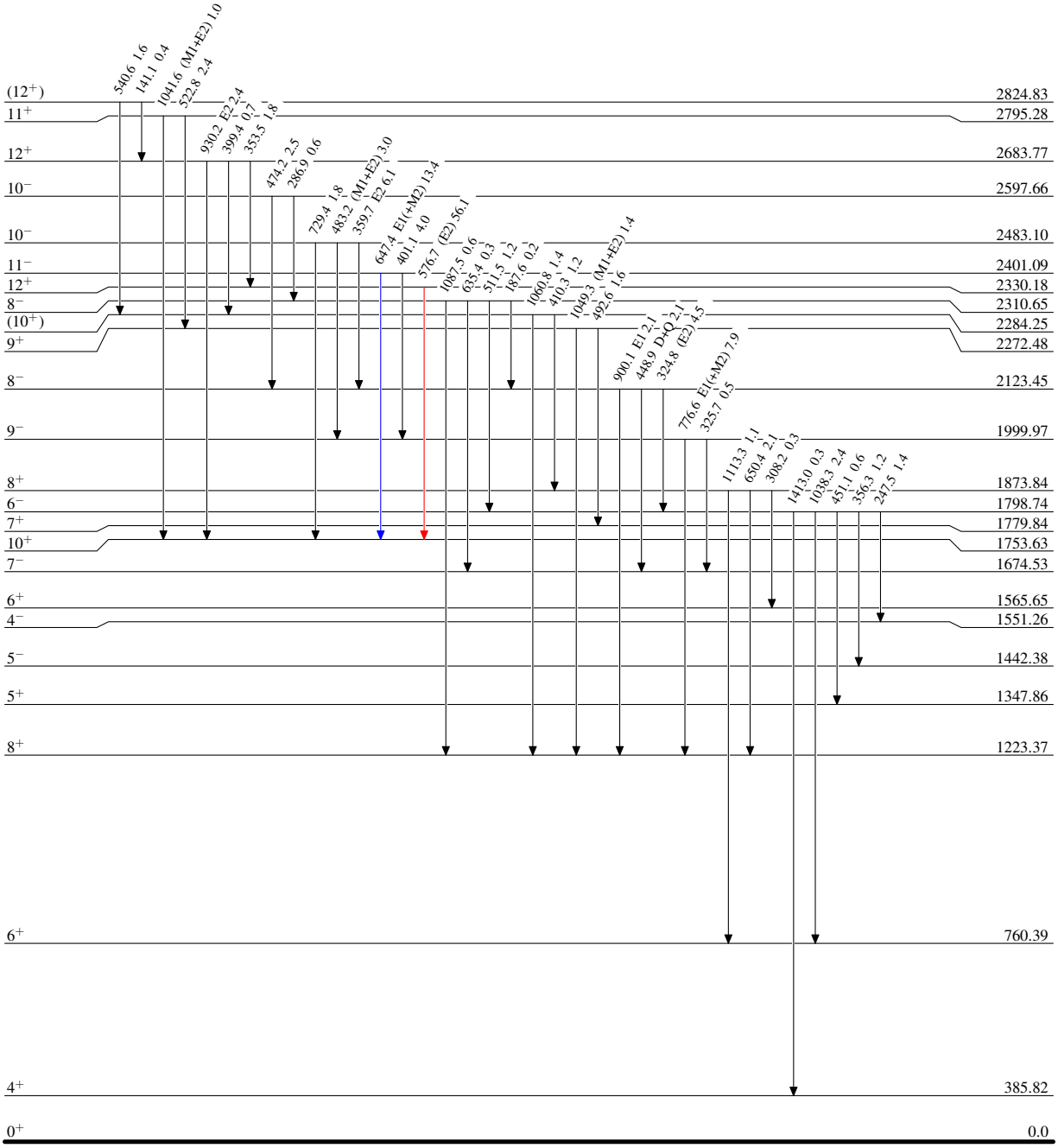
Intensities: Relative I_γ

Legend

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

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

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

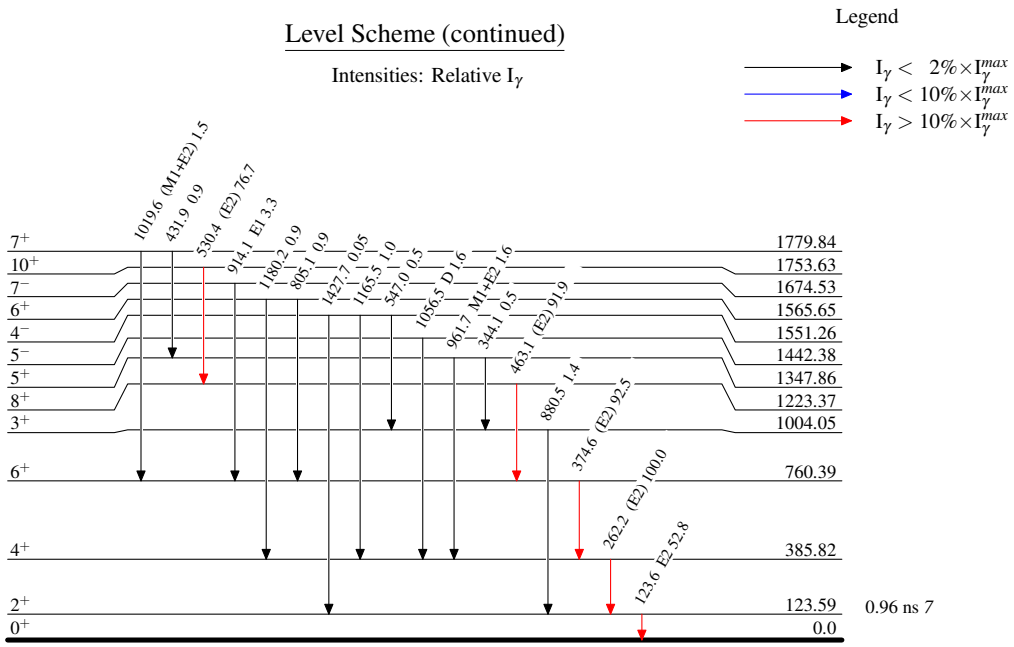


$^{164}_{70}Yb_{94}$

$^{152}Sm(^{16}O,4n\gamma)$ 1995No04

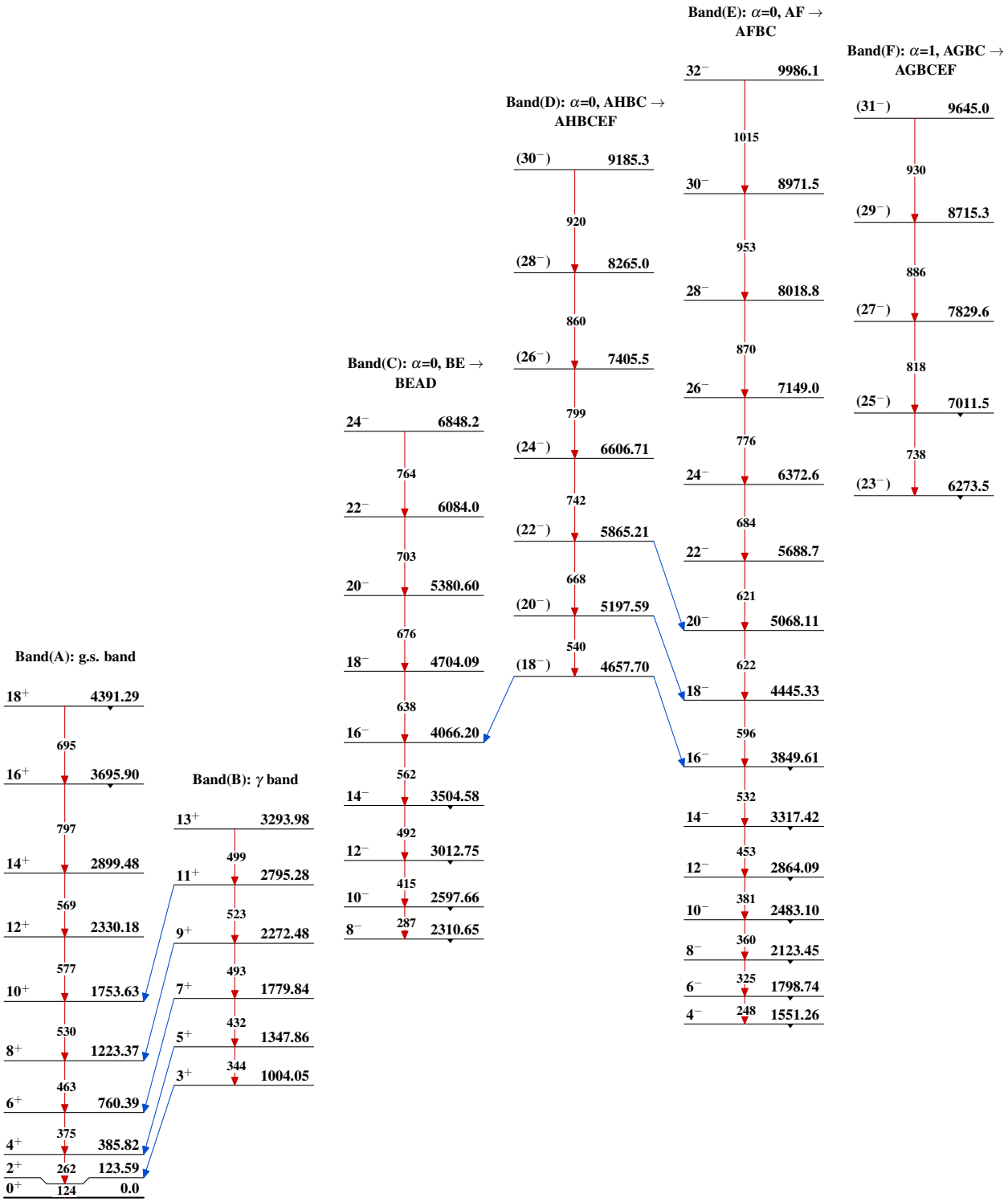
Level Scheme (continued)

Intensities: Relative I_γ

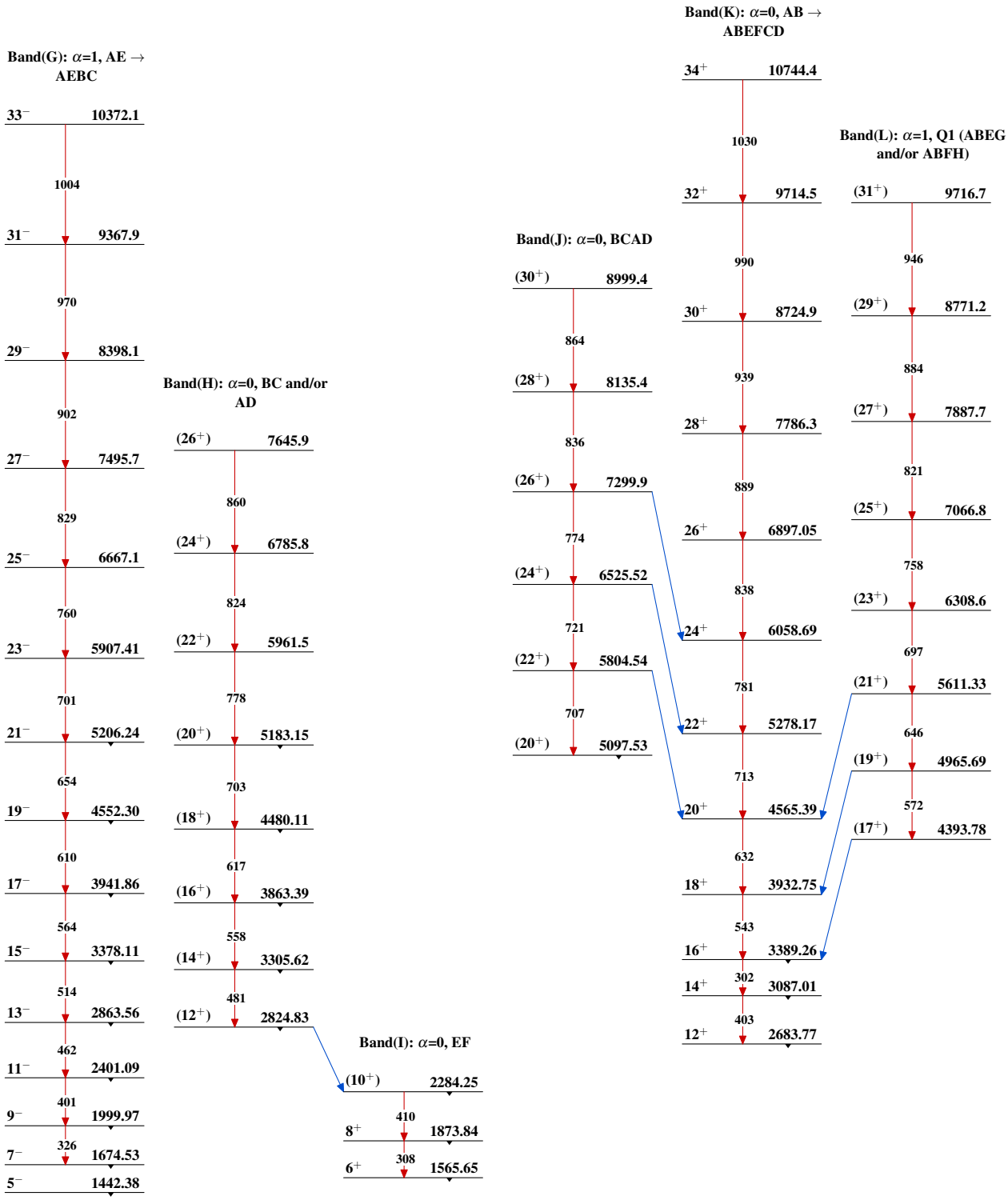


$^{164}_{70}Yb_{94}$

$^{152}Sm(^{16}O,4n\gamma)$ 1995No04

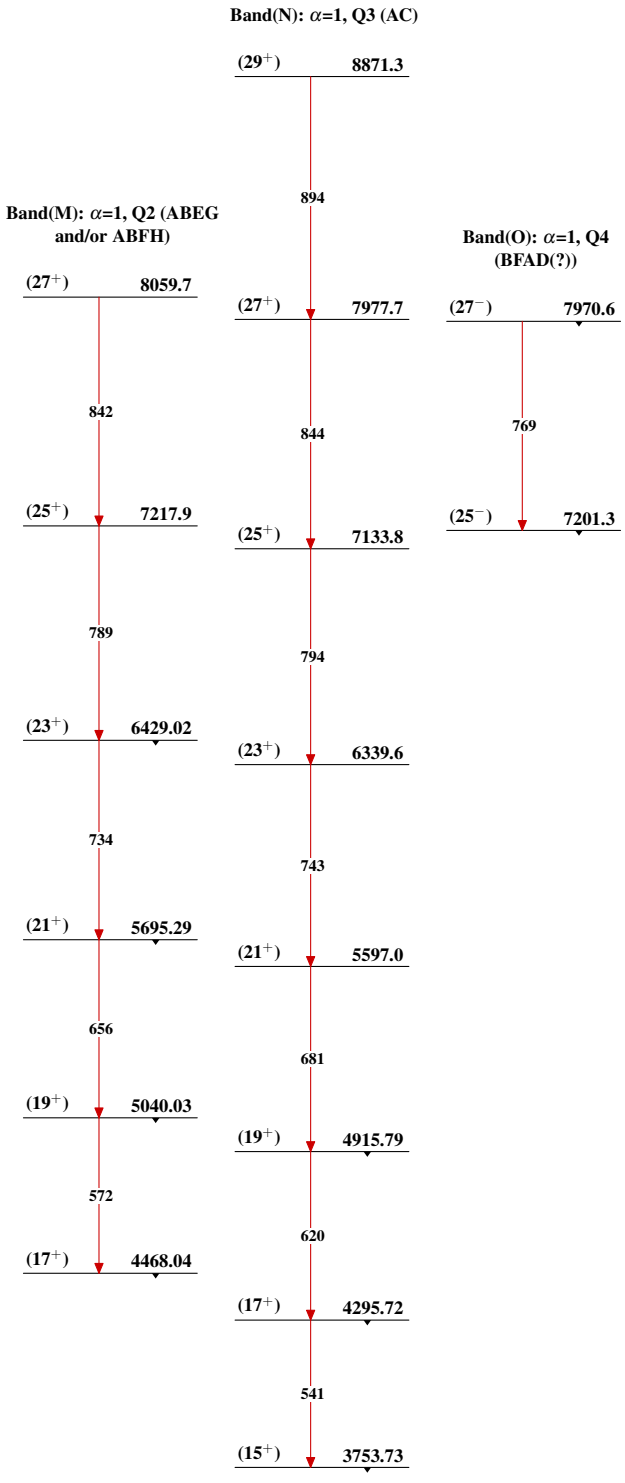


$^{152}Sm(^{16}O,4n\gamma)$ 1995No04 (continued)



$^{164}_{70}Yb_{94}$

$^{152}Sm(^{16}O,4n\gamma)$ 1995No04 (continued)



$^{164}_{70}Yb_{94}$