^{115}In(^{34}S,3nγ) 2004Kr14

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov, A. Rodionov and G. Shulyak	NDS 136, 163 (2016)	14-Jul-2016

2004Kr14: ^{115}In(^{34}S,3nγ), E=140 MeV; measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$, lin pol. ^{146}Tb: deduced levels, J^π, configurations. 15UD Pelletron, the Gamma Array comprised of eight Compton-suppressed Clover detectors.

^{146}Tb Levels

E(level)[†]	J$^\pi$[@]	T$_{1/2}$	Comments
0.0+x[‡#]	5$^-$	24.1 s *5*	T$_{1/2}$: From Iγ(t) (1993Al03). Additional information 1. J$^\pi$: From 'Adopted Levels'.
18.70+x[#] *18*	6$^-$		J$^\pi$: From 'Adopted Levels'.
156.70+x[#] *10*	6$^-$		J$^\pi$: From 'Adopted Levels'.
361.90+x[#] *15*	7$^-$		J$^\pi$: From 'Adopted Levels'.
779.60+x *17*	10$^+$		
1370.10+x *23*	11$^+$		
2147.50+x *25*	11$^-$		
2170.6+x *3*	(11$^-$)		
2188.18+x *25*	12$^-$		
2224.22+x *25*	(12$^+$)		
2577.8+x *3*	13$^-$		
2920.8+x *3*	(13$^+$)		
3085.0+x *3*	13		
3150.1+x *3*			E(level): in table 1 (2004Kr14), E(level)=2760.6 is a misprint (according to fig. 1 572.0γ populates 2578.1 keV level), other measurements indicate the same.
3264.3+x *3*	(14$^+$)		
3284.3+x *3*	14$^-$		
3368.0+x *3*	15$^-$		
3487.9+x *3*	16$^-$		
3580.2+x *3*	(15$^+$)		
3584.9+x *4*	17$^-$		
3691.7+x *3*			
3905.0+x *3*	15$^{(-)}$		
3945.8+x *4*	(16$^+$)		
4115.1+x *4*	18$^-$		
4140.6+x *4*	17$^-$		
4217.4+x *3*	17$^-$		
4464.6+x *3*	18$^+$		
4506.2+x *4*	(17$^-$)		
4580.0+x *4*	19$^-$		
4690.4+x[&] *4*	18$^+$		
4775.9+x *4*	(18$^-$)		
4867.4+x *4*	19$^+$		
5075.2+x[&] *4*	19$^+$		
5134.1+x *3*	19$^-$		
5277.8+x[a] *4*	19		
5365.0+x[&] *4*	20$^+$		
5492.4+x[a] *4*	20		
5543.0+x *4*	20$^+$		
5580.7+x *4*	20$^-$		
5741.6+x *4*			
5809.2+x *4*			
5814.4+x[&] *4*	21$^+$		

Continued on next page (footnotes at end of table)

^{115}In(^{34}S,3nγ) 2004Kr14 (continued)

^{146}Tb Levels (continued)

E(level)†	Jπ@	E(level)†	Jπ@	E(level)†	Jπ@	E(level)†	Jπ@
5853.8+x *4*		6533.6+x[a] *4*	22	7737.1+x[b] *4*	(23$^+$)	9303.7+x[b] *5*	(27$^+$)
5946.3+x[a] *4*	21	6682.9+x[a] *5*		8003.6+x[b] *5*	(24$^+$)	9717.1+x[b] *5*	(28$^+$)
6388.0+x[&] *4*	22$^+$	6836.3+x[&] *5*	(24$^+$)	8302.4+x *5*		10191.7+x[b] *5*	(29$^+$)
6440.0+x *4*		7097.0+x[a] *5*		8370.1+x *5*	(24$^+$)	10654.8+x[b] *6*	(30$^+$)
6492.6+x *4*	22$^+$	7142.8+x[&] *5*		8388.6+x[b] *5*	(25$^+$)		
6495.9+x[&] *5*	23$^{(+)}$	7563.3+x *4*	24$^+$	8874.4+x[b] *5*	(26$^+$)		

† From a least-squares fit to Eγ's, normalized χ^2=1.7.

‡ The value is not known exactly. It is supposed as 150 keV *110* higher g.s. (from systematics, 2012Au07).

From 'Adopted Levels'; not studied by 2004Kr14 but presented in fig. 1 of this paper as the basis of the level scheme.

@ From 2004Kr14 based on multipolarities of γ-transitions and the shell model treatment. Detailed shell-model configurations for many levels are given in table II of 2004Kr14.

& Band(A): Level sequence based on the J^π=18$^+$ state. Possible configuration=$\pi(h^3_{11/2}d^{-2}_{5/2})\nu h^{-1}_{11/2}$ and/or $\pi(h^3_{11/2}g^{-2}_{7/2})\nu h^{-1}_{11/2}$.

a Band(B): Level sequence based on the J=19 state. Possible configuration=$\pi h_{11/2}\nu(h^{-3}_{11/2}f^2_{7/2})$.

b Band(C): Probable magnetic-dipole rotational band based on the state with J^π=(23$^+$). Possible configuration=$\pi(h^3_{11/2}d^{-2}_{5/2})\otimes\nu(h^{-3}_{11/2}f^2_{7/2})$.

^{115}In(^{34}S,3nγ) 2004Kr14 (continued)

$\gamma(^{146}Tb)$

R_{DCO}=($I_{\gamma 1}$ at 80°, gated with γ_2 at 140°) / ($I_{\gamma 1}$ at 140°, gated with γ_2 at 80°) (obtained from sum gate of 590, 818, 390, and 760 keV dipole transitions, except as noted).

Asymmetry parameters Δ_{IPDCO}=pol=(*a*N(perpendicular)−N(parallel)) / (*a*N(perpend.)+N(parallel)) were measured and specified a polarization; parameter '*a*' is a function of Eγ (2004Kr14).

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[b]	Comments
40.7[&]		2188.18+x	12$^-$	2147.50+x	11$^-$			
53.6[&]		2224.22+x	(12$^+$)	2170.6+x	(11$^-$)			
76.7[&]		2224.22+x	(12$^+$)	2147.50+x	11$^-$			
83.7	9.2 *10*	3368.0+x	15$^-$	3284.3+x	14$^-$			
97.0	11.4 *15*	3584.9+x	17$^-$	3487.9+x	16$^-$			
107.9	3.9 *4*	6495.9+x	23$^{(+)}$	6388.0+x	22$^+$	D		DCO=0.91 *6*
119.9	34 *4*	3487.9+x	16$^-$	3368.0+x	15$^-$	D		DCO=1.26 *8*
138.00[@] *14*		156.70+x	6$^-$	18.70+x	6$^-$			
149.3		6682.9+x		6533.6+x	22			
156.7[@] *1*		156.70+x	6$^-$	0.0+x	5$^-$			
177.1	10.0 *11*	4867.4+x	19$^+$	4690.4+x	18$^+$	M1	0.437	DCO=1.06 *6* pol=−0.04 *5*.
199.4	6.2 *7*	3284.3+x	14$^-$	3085.0+x	13	D[a]		DCO=1.19 *8*
203.7	4.4 *6*	3691.7+x		3487.9+x	16$^-$			
205.2[@] *1*		361.90+x	7$^-$	156.70+x	6$^-$			
214.4	5.6 *6*	5492.4+x	20	5277.8+x	19	D		DCO=0.95 *6*
233.7	8.7 *10*	5814.4+x	21$^+$	5580.7+x	20$^-$	D		DCO=1.11 *7*
247.3	15.1 *17*	4464.6+x	18$^+$	4217.4+x	17$^-$	E1	0.0270	DCO=0.91 *5* pol=+0.08 *5*.
266.5	1.1 *2*	8003.6+x	(24$^+$)	7737.1+x	(23$^+$)	D		DCO=1.10 *8*
269.7		4775.9+x	(18$^-$)	4506.2+x	(17$^-$)	D[a]		DCO=1.31 *11*
289.9	7.1 *7*	5365.0+x	20$^+$	5075.2+x	19$^+$	M1	0.1139	DCO=1.30 *9* pol=−0.03 *2*.
306.5		7142.8+x		6836.3+x	(24$^+$)			E=7593.0 in table I (2004Kr14) is a misprint; should be 7142.8, see the level scheme at fig. 1.
312.3	4.2 *7*	4217.4+x	17$^-$	3905.0+x	15$^{(-)}$	E2[a]	0.0552	DCO=1.96 *15* pol=+0.13 *7*.
316.0	6.3 *10*	3580.2+x	(15$^+$)	3264.3+x	(14$^+$)	M1[a]	0.0905	DCO=1.13 *11* pol=−0.06 *4*.
323.8	3.5 *4*	3691.7+x		3368.0+x	15$^-$			
340.4		6836.3+x	(24$^+$)	6495.9+x	23$^{(+)}$	D	0.0743	DCO=0.86 *5*
343.2	6.3 *10*	3264.3+x	(14$^+$)	2920.8+x	(13$^+$)	M1[a]	0.0727	DCO=0.89 *7* pol=−0.06 *6*.
358.3	5.8 *7*	5134.1+x	19$^-$	4775.9+x	(18$^-$)	M1[a]	0.0650	DCO=0.96 *7* pol=−0.07 *5*.

From ENSDF

^{115}In(^{34}S,3nγ) 2004Kr14 (continued)

$\gamma(^{146}Tb)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[b]	Comments
365.7	7.3 *11*	3945.8+x	(16$^+$)	3580.2+x	(15$^+$)	(M1+E2)[a]	0.048 *14*	DCO=1.24 *9* pol=+0.02 *3*. Mult.: ΔJ=1 transition.
384.9	11.1 *15*	5075.2+x	19$^+$	4690.4+x	18$^+$	D		DCO=0.90 *5* pol=−0.02 *3*.
385.2	2.3 *4*	8388.6+x	(25$^+$)	8003.6+x	(24$^+$)	D		DCO=0.89 *6*
389.6	90 *11*	2577.8+x	13$^-$	2188.18+x	12$^-$	M1	0.0522	DCO=1.04 *6* pol=−0.02 *1*.
408.8	10.2 *11*	5543.0+x	20$^+$	5134.1+x	19$^-$	E1	0.00781	DCO=0.95 *6* pol=+0.10 *5*.
413.4	0.7 *1*	9717.1+x	(28$^+$)	9303.7+x	(27$^+$)	D		DCO=0.93 *7*
414.1		7097.0+x		6682.9+x				
417.70[@] *8*		779.60+x	10$^+$	361.90+x	7$^-$			
429.3	0.7 *1*	9303.7+x	(27$^+$)	8874.4+x	(26$^+$)	D		DCO=1.17 *11*
449.5	9.1 *11*	5814.4+x	21$^+$	5365.0+x	20$^+$	M1	0.0360	DCO=1.27 *8* pol=−0.17 *3*.
453.9	5.6 *6*	5946.3+x	21	5492.4+x	20	D		DCO=1.25 *9*
463.1		10654.8+x	(30$^+$)	10191.7+x	(29$^+$)	D		DCO=0.90 *8*
464.7	12.2 *15*	4580.0+x	19$^-$	4115.1+x	18$^-$	M1	0.0331	DCO=0.98 *6* pol=−0.02 *1*.
474.6	0.4 *1*	10191.7+x	(29$^+$)	9717.1+x	(28$^+$)	D		DCO=1.10 *8*
486.0	1.2 *3*	8874.4+x	(26$^+$)	8388.6+x	(25$^+$)	M1	0.0295	DCO=0.92 *7* pol=−0.07 *3*.
525.7	8.5 *10*	4217.4+x	17$^-$	3691.7+x				
530.1	23 *3*	4115.1+x	18$^-$	3584.9+x	17$^-$	M1	0.0236	DCO=0.95 *6* pol=−0.03 *2*.
549.8	3.2 *6*	4690.4+x	18$^+$	4140.6+x	17$^-$	E1	0.00399	DCO=1.23 *7* pol=+0.08 *6*.
560.5	7.0 *11*	4506.2+x	(17$^-$)	3945.8+x	(16$^+$)	E1[a]	0.00382	DCO=1.06 *7* pol=+0.05 *4*.
572.0	2.7 *5*	3150.1+x		2577.8+x	13$^-$			
573.6	12.0 *17*	6388.0+x	22$^+$	5814.4+x	21$^+$	M1	0.0194	DCO=0.96 *6* pol=−0.08 *5*.
587.3		6533.6+x	22	5946.3+x	21	D		DCO=0.90 *6*
590.5	>125	1370.10+x	11$^+$	779.60+x	10$^+$	M1	0.0180	DCO=0.93 *6* pol=−0.02 *1*.
633.0	0.5 *1*	8370.1+x	(24$^+$)	7737.1+x	(23$^+$)	D		DCO=1.00 *9*
640.6	11.2 *18*	3905.0+x	15$^{(-)}$	3264.3+x	(14$^+$)	E1[a]	0.00288	DCO=0.77 *4* pol=+0.14 *7*.
652.7	7.0 *7*	4140.6+x	17$^-$	3487.9+x	16$^-$	M1	0.01400	DCO=1.11 *8* pol=−0.07 *4*.
666.4	3.2 *4*	5741.6+x		5075.2+x	19$^+$	D		DCO=1.14 *9*
669.5	2.7 *4*	5134.1+x	19$^-$	4464.6+x	18$^+$			

From ENSDF

$^{146}_{65}Tb_{81}$-4

$^{115}In(^{34}S,3n\gamma)$ 2004Kr14 (continued)

$\gamma(^{146}Tb)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[b]	Comments
696.3	2.5 *5*	2920.8+x	(13^+)	2224.22+x	(12^+)			
706.4	81 *9*	3284.3+x	14^-	2577.8+x	13^-	M1	0.01151	DCO=0.96 *6* pol=−0.02 *1*.
713.3	3.3 *4*	5580.7+x	20^-	4867.4+x	19^+	E1	0.00230	DCO=0.79 *6* pol=+0.04 *3*.
729.6	14.9 *17*	4217.4+x	17^-	3487.9+x	16^-	M1	0.01062	DCO=1.13 *7* pol=−0.03 *2*.
739.1		8302.4+x		7563.3+x	24^+			
777.4	15.0 *24*	2147.50+x	11^-	1370.10+x	11^+	D[a]		DCO=1.84 *13* pol=+0.03 *2*. Mult.: ΔJ=0 transition.
785.0	3.7 *4*	5365.0+x	20^+	4580.0+x	19^-			
800.5	11.2 *18*	2170.6+x	(11^-)	1370.10+x	11^+	D[a]		DCO=2.27 *16* pol=+0.02 *3*. Mult.: ΔJ=0, E1 transition (ΔJ=1) assigned in 2004Xi01 and 1997Co23 is doubtful.
818.1	100	2188.18+x	12^-	1370.10+x	11^+	E1	1.75×10^{-3}	DCO=1.09 *7* pol=+0.02 *1*.
825.3[c]		8388.6+x	(25^+)	7563.3+x	24^+			
854.1	1.1 *3*	2224.22+x	(12^+)	1370.10+x	11^+			
870.6		8874.4+x	(26^+)	8003.6+x	(24^+)			
896.9	5.6 *10*	3085.0+x	13	2188.18+x	12^-	D[a]		DCO=0.74 *5*
916.4	4.8 *6*	5134.1+x	19^-	4217.4+x	17^-			
949.6	17.4 *21*	6492.6+x	22^+	5543.0+x	20^+	E2	0.00323	DCO=1.89 *13* pol=+0.08 *3*.
960.0	5.0 *6*	5075.2+x	19^+	4115.1+x	18^-	E1	1.29×10^{-3}	DCO=1.00 *6* pol=+0.05 *3*.
1000.6		5580.7+x	20^-	4580.0+x	19^-			
1040.3	12.2 *18*	3264.3+x	(14^+)	2224.22+x	(12^+)	E2[a]	0.00267	DCO=1.73 *11* pol=+0.02 *2*.
1070.7	4.6 *6*	7563.3+x	24^+	6492.6+x	22^+	E2	0.00251	DCO=2.52 *18* pol=+0.23 *12*.
1078.6	14.9 *17*	5543.0+x	20^+	4464.6+x	18^+	E2	0.00248	DCO=2.45 *16* pol=+0.09 *4*.
1105.7	4.8 *6*	4690.4+x	18^+	3584.9+x	17^-	D		DCO=1.16 *8*
1162.6	2.3 *2*	5277.8+x	19	4115.1+x	18^-	D		DCO=1.11 *8*
1244.5	4.4 *6*	7737.1+x	(23^+)	6492.6+x	22^+	D		DCO=0.82 *5*
1273.8		5853.8+x		4580.0+x	19^-			
1377.4	1.6 *4*	5492.4+x	20	4115.1+x	18^-			
1692.9	5.4 *6*	5277.8+x	19	3584.9+x	17^-	Q		DCO=2.34 *15*
1860.0		6440.0+x		4580.0+x	19^-			
2229.0		5809.2+x		3580.2+x	(15^+)			

From ENSDF

$^{146}_{65}Tb_{81}$-5

^{115}In(^{34}S,3nγ) 2004Kr14 (continued)

γ(^{146}Tb) (continued)

† From 2004Kr14, except as noted; $\Delta E\gamma$=0.15 was assumed by evaluators if unknown.
‡ From 2004Kr14, intensities are not given for weak transitions.
# E1, M1 or E2 is from $\gamma\gamma(\theta)$(DCO) and lin pol data as plotted in figure 7 of 2004Kr14. The mult=D, E1 or M1 corresponds to ΔJ=1 in most cases, except for two ΔJ=0 cases as indicated; mult=E2 or Q corresponds to ΔJ=2 transitions.
@ From 'Adopted Gammas'.
& Difference between corresponding Eγ's.
a DCO from gate on γ(590), ΔJ=1 transition.
b Additional information 2.
c Placement of transition in the level scheme is uncertain.

From ENSDF

$^{146}_{65}Tb_{81}$-6

^{115}In(^{34}S,3nγ) **2004Kr14**

Level Scheme

Intensities: Relative I_γ

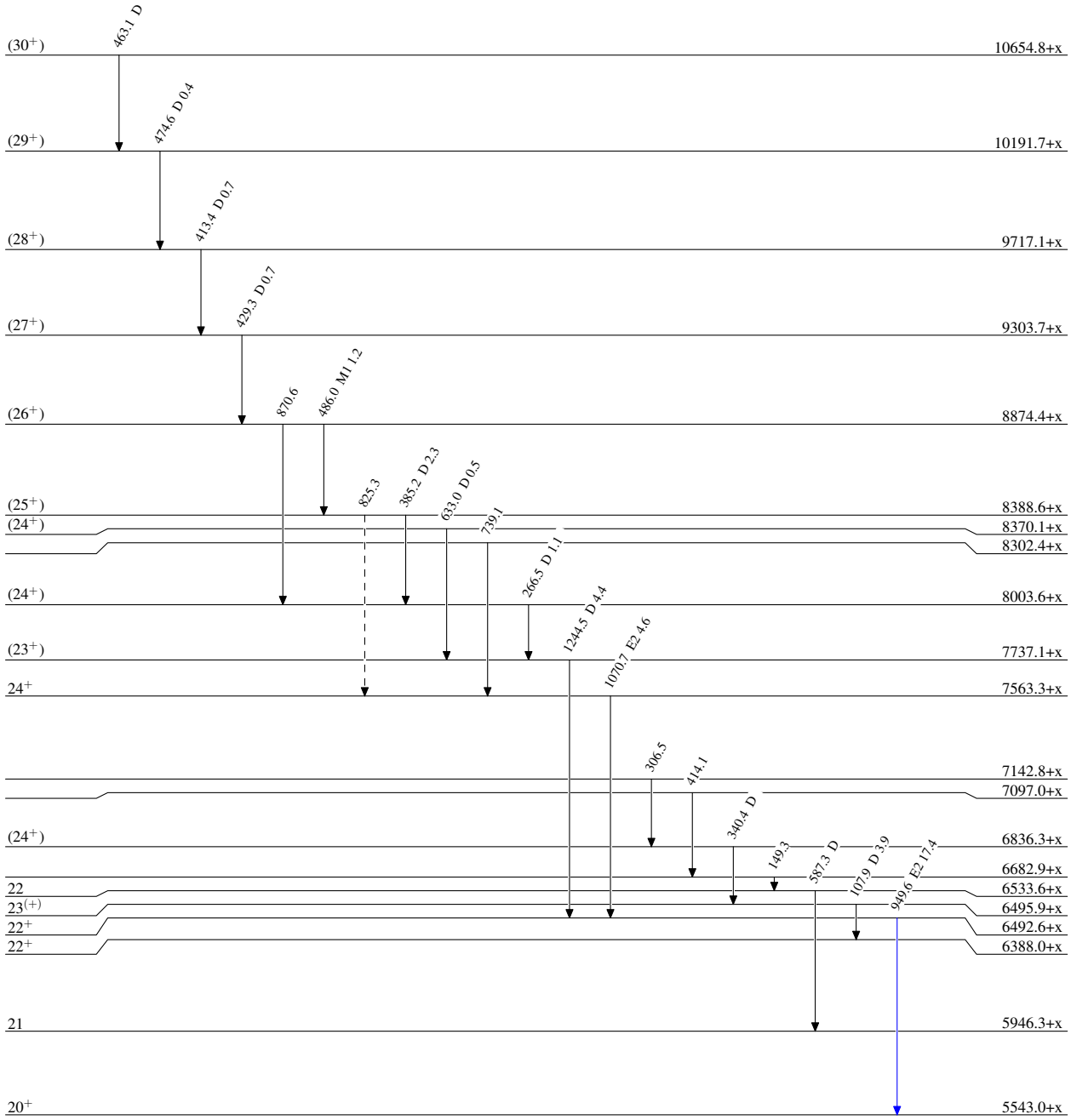
Legend

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

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

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

γ Decay (Uncertain)



$^{146}_{65}Tb_{81}$

^{115}In(^{34}S,3nγ) 2004Kr14

Level Scheme (continued)

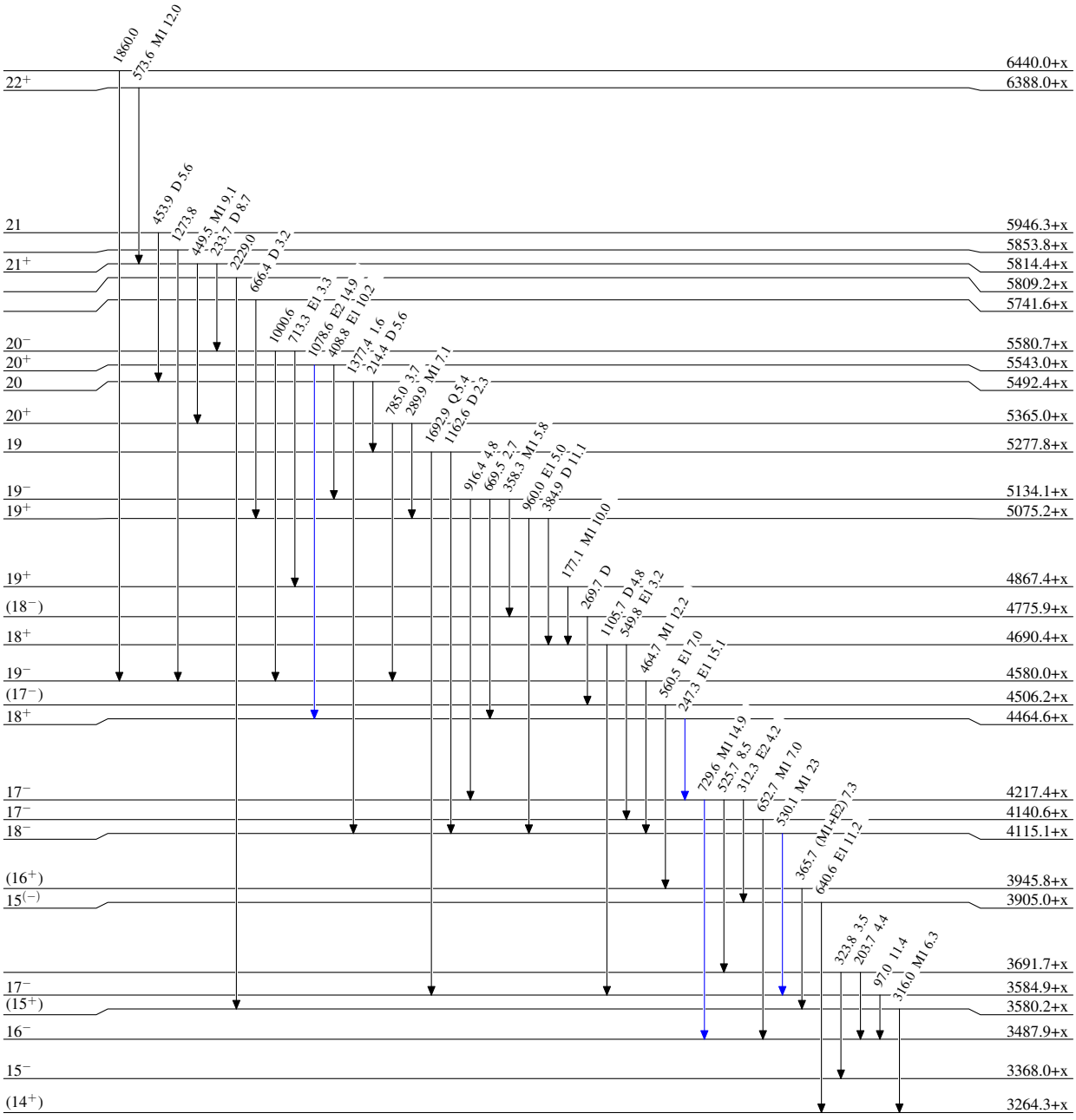
Intensities: Relative I_γ

Legend

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

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

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

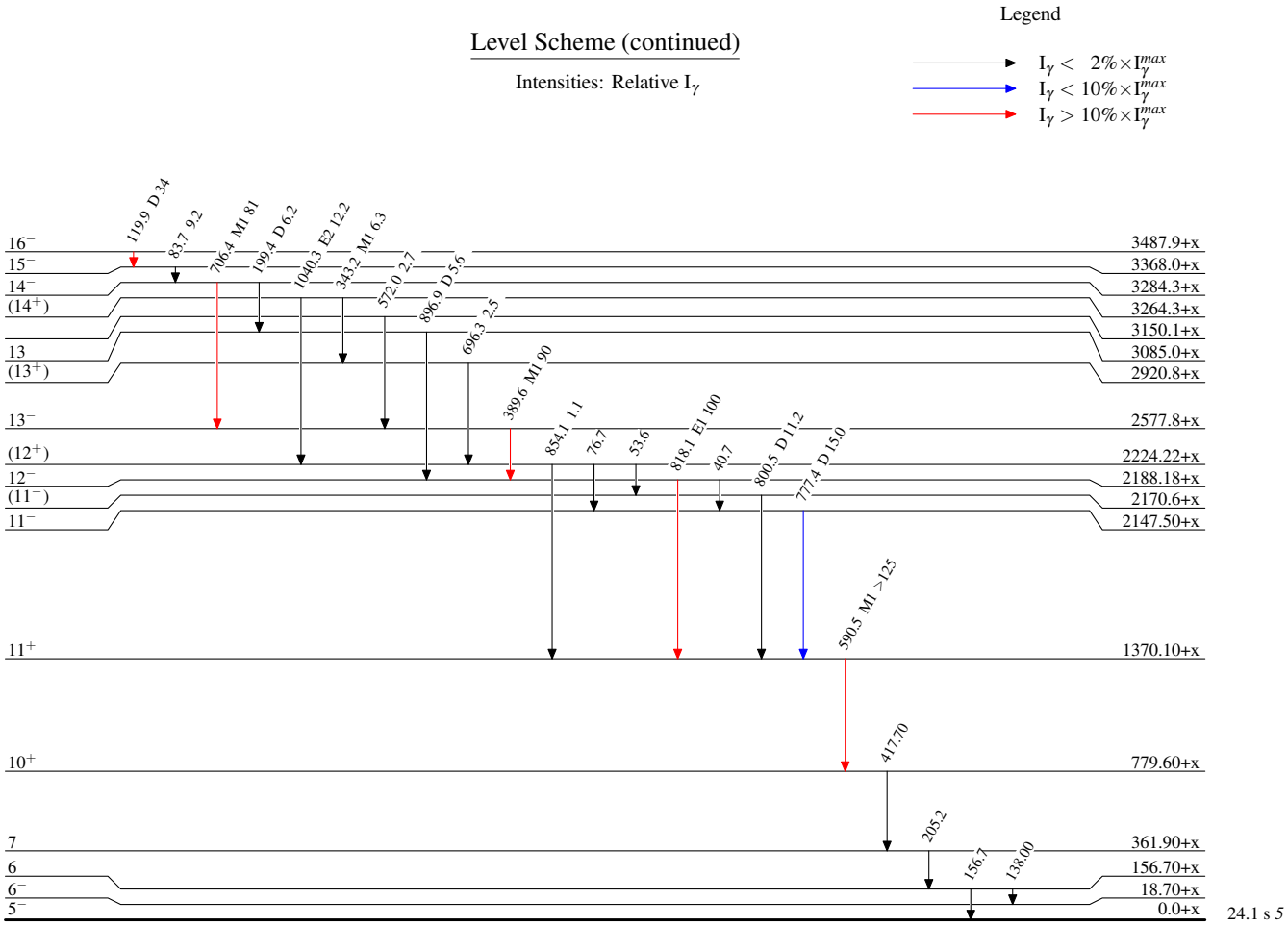


$^{146}_{65}Tb_{81}$

^{115}In(^{34}S,3nγ) 2004Kr14

Level Scheme (continued)

Intensities: Relative I_γ



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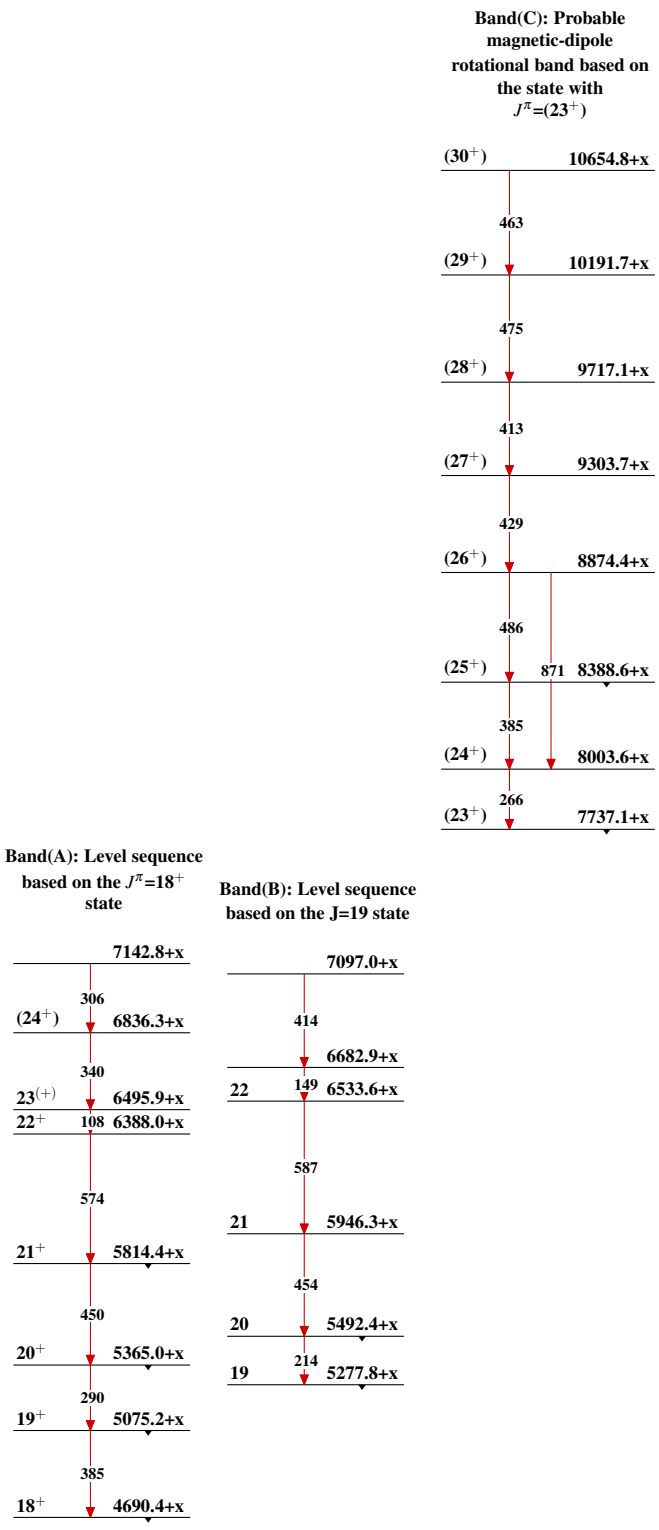
$^{115}In(^{34}S,3n\gamma)$ 2004Kr14



$^{146}_{65}Tb_{81}$