^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 200,2 (2025)	22-Aug-2022

The decay scheme is from 1988Ka01, who built on the scheme from the (n,γ) work of 1984Ro06. The γ data are from 1980Be61 and 1988Ka21.

1988Ka01: ^{154}Sm(^{3}He,p2nγ), E(^{3}He)=22 to 27 MeV and (d,2nγ), E(d)=10 MeV. Only those γ's placed in the scheme are reported. No Iγ values are reported, and only a general statement of the uncertainties in the γ energies (0.1 to 0.2 keV) is given.

1980Be61: ^{154}Sm(d,2nγ), E(d)=13.5 MeV and (p,nγ), E(p)=6.7 MeV. No γ placements given, but Eγ and Iγ are given with uncertainties for both reactions.

^{154}Eu Levels

E(level)[†]	J$^{\pi}$[‡]	$T_{1/2}$[#]	Comments
0.0	3^-		
68.17 *1*	2^+	2.2 μs *1*	
71.89 *3*	1^+		
80.7	4^-		
82.8	1^-		
99.78 *6*	3^+		
100.86 *1*	4^+		
122.42 *22*	2^-		
127.55 *4*	4^+		
129.7	4^-		
134.7 *3*	1^+		
136.62 *4*	5^+		
145	8^-	47.0 min *5*	
162.43 *15*	1^-		
173.54 *2*			
175.47 *2*	5^-		
180.7 *2*	5^-		
180.81 *3*	2^-		
192.42 *5*			
197.2	(6^+)		
203.8	4^+		J$^{\pi}$: $(4)^+$ in Adopted Levels.
214.14 *4*			
219.48 *2*			
229.8	(6^-)		J$^{\pi}$: $(6)^-$ in Adopted Levels.
230.69 *6*			
235.15 *6*			
239.3	3^-		
249.4	1^+		J$^{\pi}$: $(1)^+$ in Adopted Levels.
273.00 *5*			
276.7	(7^+)		
278.6			
279.0			
279.4			
281.7	3^+		
282.840 *18*	2^+		J$^{\pi}$: $(2)^+$ in Adopted Levels.
294.0	(7^-)		
295.8			
296.66 *8*			
300.0	6^-		J$^{\pi}$: $(6)^-$ in Adopted Levels.
311	(9^-)		
319.2	3^+		J$^{\pi}$: $(3)^+$ in Adopted Levels.
328.0			
335.6	(3^+)		

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^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61 (continued)

^{154}Eu Levels (continued)

E(level)†	Jπ‡	Comments
338.0		
342.0		
344.0		
356		
356.1		
362.4		
363.9	5^-	Jπ: $(5)^-$ in Adopted Levels.
367	(8^-)	
371.5		E(level): Levels shown here as 371.5 and 371.8 are given in the Adopted Levels as one level with the both the 157 and 209 γ′s depopulating it.
371.8		
375.9		
376.8	(8^+)	
378		E(level): Levels shown here as 378 and 378.7 are given in the Adopted Levels as one level with γ′s of 99.3, 203.2, and 205.1 depopulating it.
378.7		
390.2		
390.5	(4^+)	
400		
401		
415.5		
419.7		
438.1 *5*	(7^-)	
454		
475		
480.4	(5^+)	
483	(10^-)	
494	(9^+)	
495		
566		
589.3	(6^+)	
593.3 *7*	(8^-)	
702		
722	(7^+)	
765.8 *8*	(9^-)	
952 *2*	(10^-)	

† Where evaluator has placed γ′s from 1980Be61, the level energies are from a least-squares fit to the γ energies; otherwise, they are from 1988Ka01. From the general comments of 1988Ka01, the latter level energies are probably accurate to about 0.1 keV; however, no uncertainties are included herein.

‡ From 1988Ka01. Any conflict with those in Adopted Levels is noted.

From 1988Ka01 and for in-beam studies only. See ^{154}Eu Adopted Levels for values from all of the available data.

γ(^{154}Eu)

Unplaced γ′s are from 1980Be61.

Coincidence relationships are from 1988Ka01.

Eγ†	Iγ‡	Ei(level)
x28.94 *7*	59 *10*	
x30.68 *5*	105 *13*	
x31.79 *3*	84 *7*	

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^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61 (continued)

$\gamma(^{154}Eu)$ (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Comments
35.76 *3*	49 *3*	136.62	5^+	100.86	4^+	
38.8		175.47	5^-	136.62	5^+	
39.8@		122.42	2^-	82.8	1^-	
45.8		175.47	5^-	129.7	4^-	
50.57 *18*	1.6 *10*	122.42	2^-	71.89	1^+	
51.03 *8*	3.5 *10*	173.54		122.42	2^-	
54.25 *2*	1.1	122.42	2^-	68.17	2^+	
54.5		229.8	(6^-)	175.47	5^-	
57.15 *5*	1.4 *5*	230.69		173.54		
59.3		127.55	4^+	68.17	2^+	
x59.82 *3*	10.6 *9*					
60.5		197.2	(6^+)	136.62	5^+	
61.61 *5*	2.7 *4*	235.15		173.54		
62.8 *3*		134.7	1^+	71.89	1^+	
64.0		294.0	(7^-)	229.8	(6^-)	
64.87 *2*	9.0 *8*	192.42		127.55	4^+	
65.3		279.4		214.14		
65.97 *5*	4.1 *6*	296.66		230.69		
66.6		134.7	1^+	68.17	2^+	
x66.95 *8*	4.0 *6*					
68.17 *1*	368 *1*	68.17	2^+	0.0	3^-	
68.6		249.4	1^+	180.81	2^-	
73		367	(8^-)	294.0	(7^-)	
74.1@		203.8	4^+	129.7	4^-	
74.61 *1*	30.5 *7*	175.47	5^-	100.86	4^+	
x77.74 *4*						
77.9		281.7	3^+	203.8	4^+	
79.5		276.7	(7^+)	197.2	(6^+)	
80.7	9.6 *9*	80.7	4^-	0.0	3^-	E_γ: Values from 1980Be61 are 80.81 *1* and 80.67 *4*.
80.9		180.81	2^-	99.78	3^+	
82.8		376.8	(8^+)	294.0	(7^-)	
83.3		356.1		273.00		
x85.08 *3*						
86.59 *2*	9.3	214.14		127.55	4^+	
87.0		249.4	1^+	162.43	1^-	
88.7		328.0		239.3	3^-	
90@		367	(8^-)	276.7	(7^+)	
90.54 *2*	7.5 *3*	162.43	1^-	71.89	1^+	
92.0		295.8		203.8	4^+	
x92.23 *4*	3.1 *3*					
x93.07 *2*	10.5 *3*					
93.3		229.8	(6^-)	136.62	5^+	
94.26 *1*	9.3 *3*	162.43	1^-	68.17	2^+	
96.8		294.0	(7^-)	197.2	(6^+)	
99.3		378.7		279.4		
100.1		180.7	5^-	80.7	4^-	
100.2		376.8	(8^+)	276.7	(7^+)	
100.86 *1*	100 *3*	100.86	4^+	0.0	3^-	
102.0		282.840	2^+	180.81	2^-	
103.0		203.8	4^+	100.86	4^+	
105		401		295.8		
105.37 *2*		173.54		68.17	2^+	
108.92 *1*	5.5 *2*	180.81	2^-	71.89	1^+	
109.6		239.3	3^-	129.7	4^-	
x112.71 *1*						

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^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61 (continued)

$\gamma(^{154}Eu)$ (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π
x112.90 2	6.0				
x113.97 12	0.65 22				
115.9		495		378.7	
116.2		278.6		162.43	1−
x116.32 7	5.4 5				
116.6		279.0		162.43	1−
x116.93 6					
117		494	(9+)	376.8	(8+)
118.5		475		356.1	
118.62 2	8.7 6	219.48		100.86	4+
119.2		300.0	6−	180.7	5−
120.41 1		282.840	2+	162.43	1−
x124.50 3	1.7 2				
x125.76 4					
x126.87 2					
x129.34 3					
x130.89 4	3.4 2				
x134.58 9					
135.37 2	4.8 2	235.15		99.78	3+
x135.80 24	1.6 12				
x136.52 5	1.7 3				
x136.74 6					
138.2		438.1	(7−)	300.0	6−
x143.98 7	1.6 3				
145.45 2	18.8 5	273.00		127.55	4+
145.97 3	6.0 5	214.14		68.17	2+
x151.85 7					
x152.33 5	6.4 7				
x153.02 4					
x154.65 9					
154.8		335.6	(3+)	180.81	2−
x154.99 7	2.4 4				
155.2		593.3	(8−)	438.1	(7−)
x156.07 3	11.4				
156.5		375.9		219.48	
x157.14 5	3.5 4				
157.7		371.8		214.14	
x158.36 3					
158.6		239.3	3−	80.7	4−
x160.26 15					
161.2		342.0		180.81	2−
x161.39 10	1.2 6				
x162.97 8					
163.8		356.1		192.42	
x164.06 2	9.8 5				
166.0		311	(9−)	145	8−
x166.67 2	4.1				
x167.70 4	3.9 4				
x168.77 8	3.2 6				
x172.39 5	3.9 4				
172.5		765.8	(9−)	593.3	(8−)
173.3		483	(10−)	311	(9−)
x173.40 11	1.5 4				
x176.21 5					
x177.58 3					
x179.29 5	2.2 3				
179.6		279.4		99.78	3+
180.2		415.5		235.15	
x180.51 5	2.5 3				
x181.58 4					
181.6		344.0		162.43	1−
181.6		362.4		180.81	2−
x182.60 2	6.8 3				
x187.45 3	2.1 3				
188.5		363.9	5−	175.47	5−
x189.25 4	3.0 3				
x190.35 2	9.4 3				
x195.64 6	4.0 6				
x200.02 4	2.8 3				
201.06 3	3.4 3	281.7	3+	80.7	4−
x203.90 7	1.5 2				
204		378		173.54	
x204.8 3					
x206.46 5	4.4 6				
207		342.0		134.7	1+
207		400		192.42	
x207.22 3	6.7 6				
209.1		371.5		162.43	1−
x209.44 6	2.3 5				
209.6@		390.5	(4+)	180.7	5−
x210.38 6	4.4 7				
x210.68 4					
x211.07 7	3.0 6				
x214.85 12	3.7 4				
x216.08 6	3.2 4				
x222.13 8					
x223.09 7	6.2 4				
x225.97 4	3.6 3				
227		328.0		100.86	4+
x227.24 6	2.5 3				
227.8		390.2		162.43	1−
x227.9 4					
x231.54 7	2.1 3				
x232.43 21					
x236.07 4	5.3 3				
x237.10 8	3.0 3				
237.1		338.0		100.86	4+
238.6		319.2	3+	80.7	4−
239		419.7		180.81	2−
x239.25 5	3.3 3				
239.3		239.3	3−	0.0	3−
x242.13 8					
x243.40 4					
x247.42 5					
x249.21 8	2.1 4				
x250.31 5	3.6 5				

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^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61 (continued)

γ(^{154}Eu) (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π
x252.05 *6*	3.8 *5*					x319.46 *7*	4.6				
x252.78 *7*	3.6 *5*					x329.86 *8*	8.0# *5*				
x257.15 *7*	3.6 *6*					x339.70 *13*	2.4 *8*				
257.3		419.7		162.43	1−	x341.59 *23*					
x257.91 *8*	3.2 *6*					x343.2 *3*	1.3 *6*				
263.1		363.9	5−	100.86	4+	x344.34 *21*					
x263.17 *5*	6.0 *3*					x347.73 *10*	5.7 *5*				
x267.0 *3*						x350.07 *15*	2.2 *7*				
x267.97 *4*	5.7					x352.57 *14*	3.3 *4*				
x270.16 *5*	4.6 *4*					x358.2 *3*					
275		356		80.7	4−	x359.01 *11*	5.1 *5*				
275.0		375.9		100.86	4+	x364.93 *11*	5.4 *6*				
x277.28 *4*	37.4 *6*					x370.58 *12*	4.7 *5*				
x277.92 *8*						373		454		80.7	4−
x281.67 *4*						x378.4 *4*					
x284.66 *18*						x379.00 *15*	2.7 *6*				
289.4		589.3	(6+)	300.0	6−	385		566		180.7	5−
x296.01 *7*	4.0 *4*					x390.28 *16*	3.2 *5*				
x296.69 *17*	2.3 *4*					399.6@		480.4	(5+)	80.7	4−
x299.06 *10*	4.5 *5*					402		702		300.0	6−
299.6@		480.4	(5+)	180.7	5−	x409.92 *14*	11.1 *7*				
x302.7 *3*	4.4					x414.88 *7*	10.8 *5*				
x303.54 *21*	2.2 *10*					422		722	(7+)	300.0	6−
309.8		390.5	(4+)	80.7	4−	x437.5 *8*					
x309.84 *11*	3.6 *8*					x464.5 *3*	1.4# *4*				
x310.73 *14*	2.9 *8*					x617.71 *12*	6.2# *5*				
x315.92 *13*	3.9 *6*					x742.60 *22*	3.3# *9*				
x318.93 *14*						x791.0 *9*	1.4 *12*				
319.2		319.2	3+	0.0	3−						

† Values with uncertainties are from 1980Be61 with placement by evaluator, all other values and placements are from 1988Ka01.
‡ From (d,2nγ) at 13.5 MeV (1980Be61). Values without uncertainties have had a contribution from ^{153}Eu subtracted.
# Value may include contribution from ^{153}Eu.
@ Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

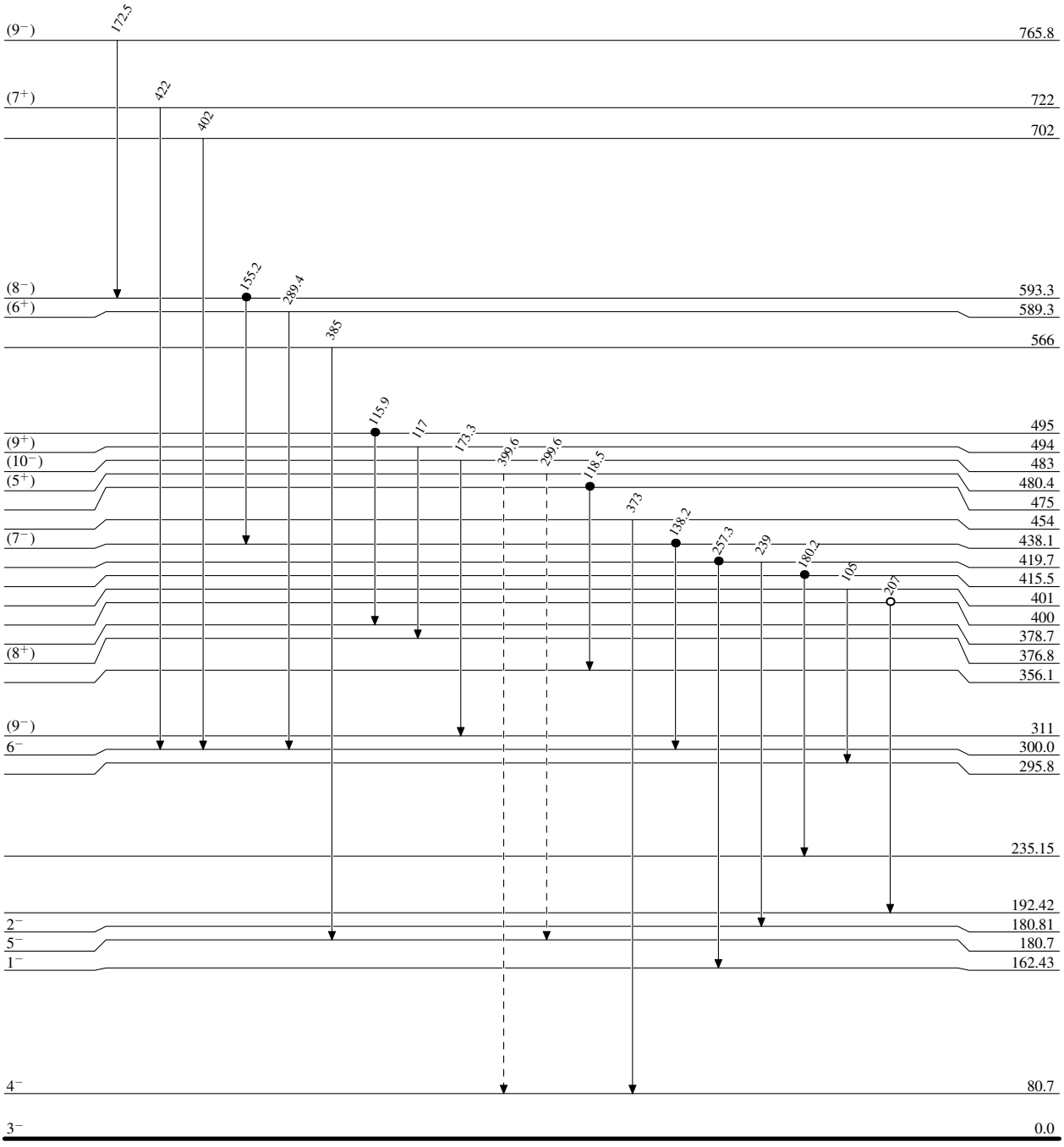
Legend

^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61

Level Scheme

Intensities: Relative I_γ

- γ Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)



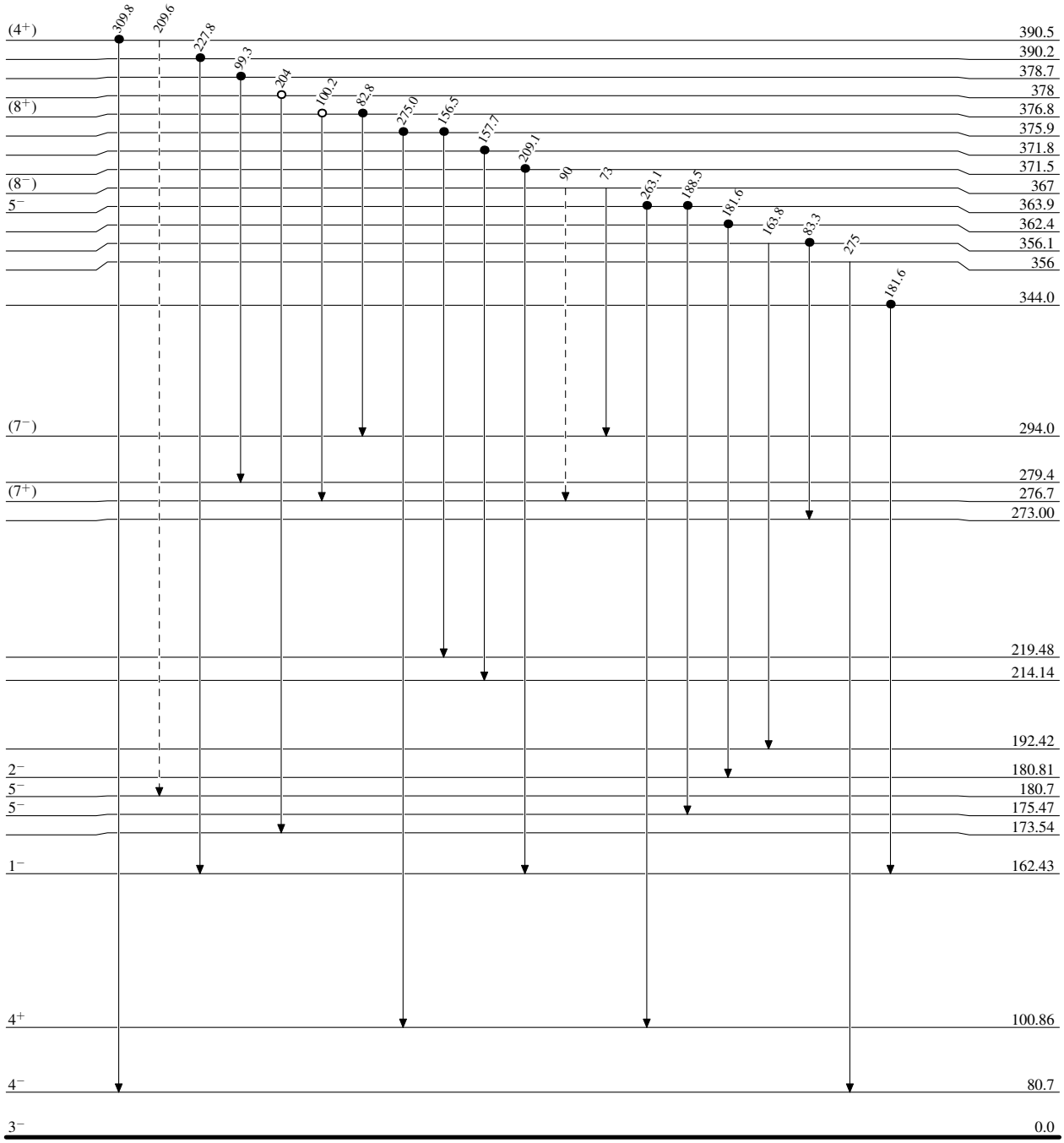
$^{154}_{63}Eu_{91}$

^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) **1988Ka01,1980Be61**

Level Scheme (continued)

Intensities: Relative I_γ

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



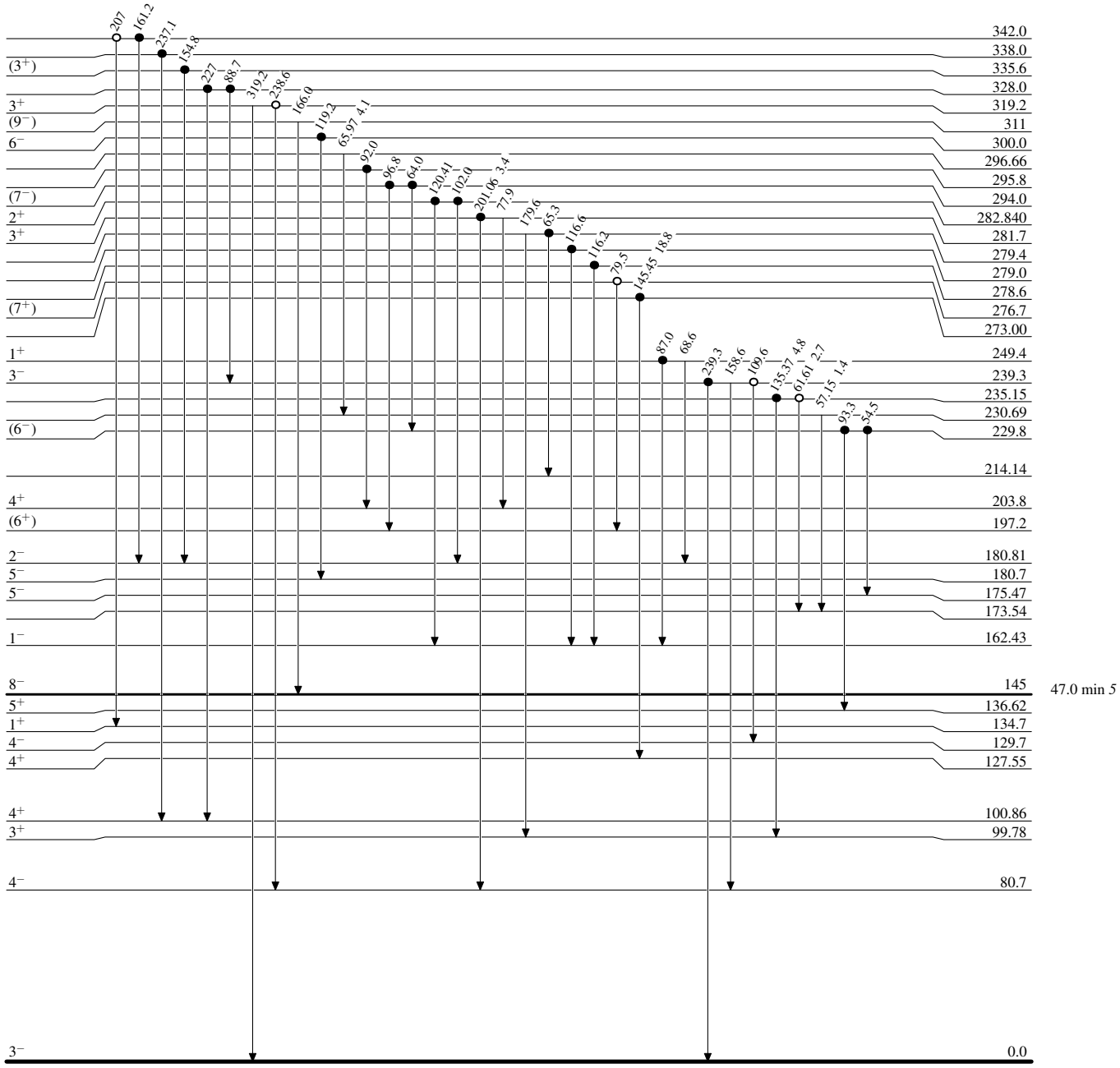
$^{154}_{63}Eu_{91}$

^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61

Level Scheme (continued)

Intensities: Relative I_γ

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



$^{154}_{63}Eu_{91}$

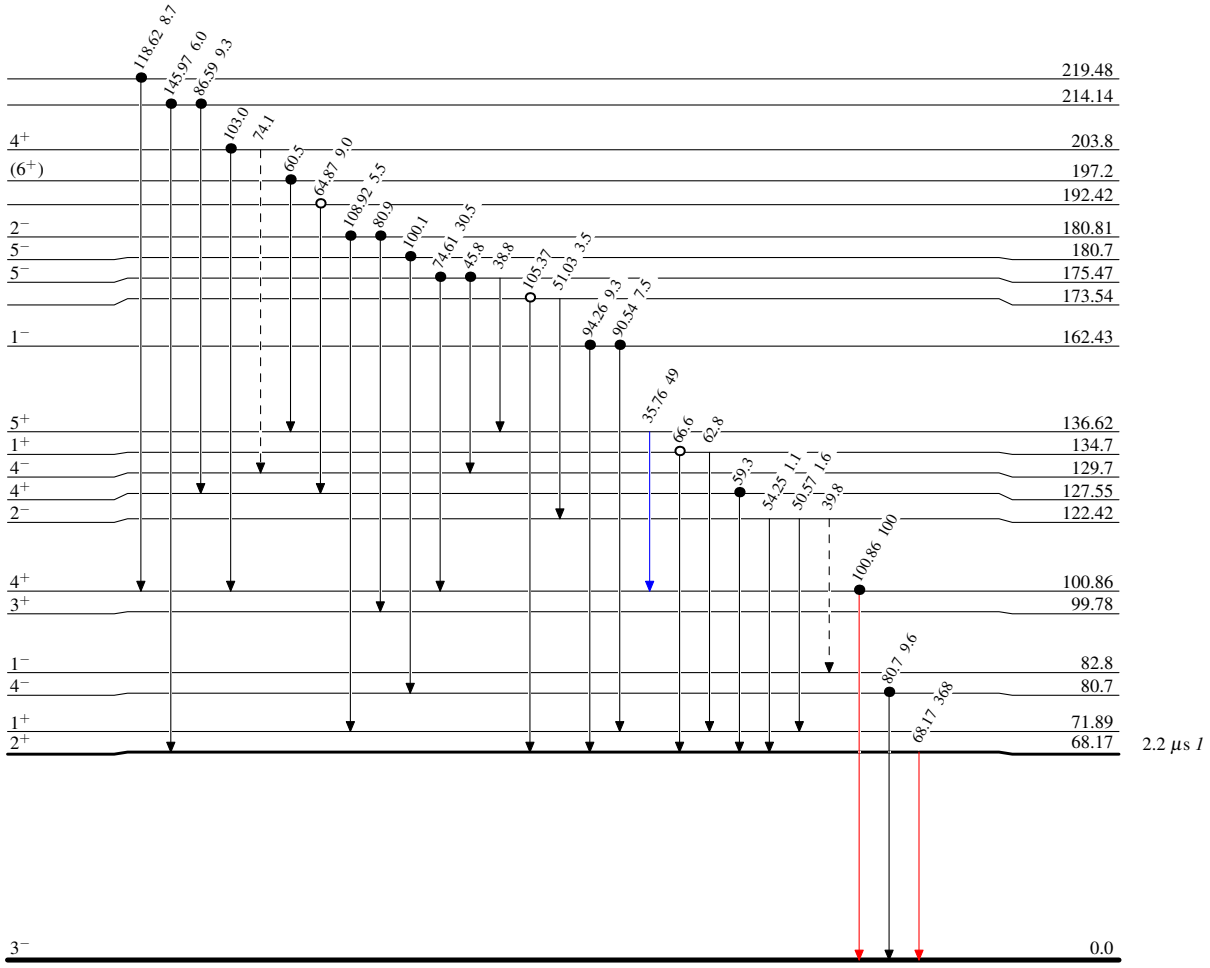
Legend

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

^{154}Sm(^{3}He,p2nγ),(d,2nγ),(p,nγ) 1988Ka01,1980Be61

Level Scheme (continued)

Intensities: Relative I_γ



$^{154}_{63}Eu_{91}$