^{144}Sm(^{14}N,4nγ) 2002Fo07

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

Additional information 1.

From ^{144}Sm(^{14}N,4nγ) with E=95 MeV. Measured Eγ, Iγ, $\gamma\gamma$, ce, ceγ coin, and lifetimes. Conversion electrons were measured with a Si(Li) detector. Also, ^{118}S(n)(^{40}Ca,p3nγ) at 205 MeV.

Data set based on that compiled for the XUNDL file by M. Lee and B. Singh (McMaster University, June 2002).

^{154}Tm Levels

E(level)[†‡]	J$^\pi$[#]	$T_{1/2}$	Comments
0	(2$^-$)	8.1 s *3*	J$^\pi$,$T_{1/2}$: from the adopted values.
0+x[@]	9$^+$	3.30 s *7*	Additional information 2. $T_{1/2}$: from the adopted values.
266.10+x[a] *17*	10$^+$		
745.12+x *9*	11$^+$		
751.79+x[@] *10*	11$^+$		
1035.09+x[a] *16*	12$^+$		
1134.98+x[@] *13*	13$^+$		
1323.34+x *13*	13$^+$		
1674.06+x[a] *14*	14$^+$		
1814.81+x[@] *19*	15$^+$		
2145.25+x[a] *16*	16$^+$		
2424.55+x *17*	(15)$^+$		
2453.99+x *25*	(16)$^+$		
2514.42+x *18*	(16)$^+$		
2616.74+x *20*	(17)$^+$		
2742.65+x *22*	(19)$^+$		$T_{1/2}$: Possible few ns isomer signaled by 1996Dr07 from delayed gammas observed at a catcher foil located at 16 cm from the target.
2750.37+x[@] *26*	(17)$^+$		
2881.58+x *27*			
3240.45+x *31*			
3409.96+x *30*	(19)$^+$		
3420.87+x *29*	(20)$^+$		
3471.61+x[@] *34*	(19)$^+$		
3740.45+x *30*	(20)$^+$		
4056.99+x *29*	(22$^+$)		
4090.77+x *29*			
4486.26+x *30*	(23)$^+$		
4498.11+x[&] *30*	(21,22)$^+$		
4667.9+x *4*			
4865.7+x *5*			
4996.80+x[&] *30*	(23,24)$^+$		
5208.80+x[&] *32*	(25,26)$^+$		E(level): The ordering of the 166.9-765.5-212.0 cascade is tentative due to similar intensities of the γ rays involved, thus the intermediate levels at 5208.8+x and 5974.2+x may be at different energies.
5974.3+x[&] *4*	(27,28)$^+$		E(level): The ordering of the 166.9-765.5-212.0 cascade is tentative due to similar intensities of the γ rays involved, thus the intermediate levels at 5208.8+x and 5974.2+x may be at different energies.
6141.2+x[&] *4*	(28,29)$^-$		

[†] Additional information 3.

Continued on next page (footnotes at end of table)

^{144}Sm(^{14}N,4nγ) 2002Fo07 (continued)

^{154}Tm Levels (continued)

‡ From least-squares fit to Eγ's. Uncertainties are relative to 9^+ level.
# Above the 9^+ level, the J^π assignments are from 2002Fo07 and are based on the γ multipolarities and the expected level sequences. No specific arguments are given for the J^π values of the levels above this one.
@ Seq.(A): γ cascade based on 9^+ isomer.
& Seq.(B): γ cascade based on $(21,22)^+$ level.
a Seq.(C): γ cascade based on 10^+ level.

γ(^{154}Tm)

Numerical values of α(K)exp, α(L)exp, and K/L ratios were provided (June, 2002) in a private communication from the first author (C. Foin) of 2002Fo07 to the compilers of the XUNDL data set. These are plotted by 2002Fo07 in figures 2-4 of 2002Fo07.

E$_\gamma$	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.‡	Comments
89.9 *1*	29	2514.42+x	$(16)^+$	2424.55+x	$(15)^+$	M1+E2	α(L)exp=0.50 *15*
102.3 *1*	37	2616.74+x	$(17)^+$	2514.42+x	$(16)^+$	M1+E2	α(L)exp=0.40 *10* I$_\gamma$: 37 (catcher foil spectrum).
125.9 *1*	70	2742.65+x	$(19)^+$	2616.74+x	$(17)^+$	E2	α(L)exp=0.44 *10* K/L=0.85 *30*. I$_\gamma$: 82 (catcher foil spectrum).
138.9 *2*	23	2881.58+x		2742.65+x	$(19)^+$		
140.6 *3*		1814.81+x	15^+	1674.06+x	14^+		E$_\gamma$: from $\gamma\gamma$ coin only.
x159.9 *2*	11						
166.9 *1*	122	6141.2+x	$(28,29)^-$	5974.3+x	$(27,28)^+$	E1	α(K)exp=0.08 *2* E$_\gamma$: The ordering of the 166.9-765.5-212.0 cascade is tentative due to similar intensities of the γ rays involved, thus the intermediate levels at 5208.8+x and 5974.2+x may be at different energies.
197.8 *2*	20	4865.7+x		4667.9+x			
212.0 *1*	116	5208.80+x	$(25,26)^+$	4996.80+x	$(23,24)^+$	E2	K/L=2.0 *4*. E$_\gamma$: The ordering of the 166.9-765.5-212.0 cascade is tentative due to similar intensities of the γ rays involved, thus the intermediate levels at 5208.8+x and 5974.2+x may be at different energies.
x214.8 *3*							
x260.2 *2*	21						
266.1 *2*	26	266.10+x	10^+	0+x	9^+		I$_\gamma$: 15 (catcher foil spectrum).
268.9 *3*	52	3740.45+x	$(20)^+$	3471.61+x	$(19)^+$	M1+E2	α(K)exp=0.14 *5* I$_\gamma$: 59 (catcher foil spectrum) for composite line. I$_\gamma$: Composite peak.
279.3 *1*	88	2424.55+x	$(15)^+$	2145.25+x	16^+	M1+E2	α(K)exp=0.163 *25* K/L=4.7 *9*. I$_\gamma$: 140 (catcher foil spectrum); line also in ^{152}Er.
290.0 *2*	13	1035.09+x	12^+	745.12+x	11^+		
296.4 *2*	39	2750.37+x	$(17)^+$	2453.99+x	$(16)^+$	M1+E2	α(K)exp=0.14 *3* I$_\gamma$: 131 (catcher foil spectrum) for composite line. I$_\gamma$: Composite peak.
330.5 *2*	46	3740.45+x	$(20)^+$	3409.96+x	$(19)^+$	M1+E2	α(K)exp=0.10 *2* K/L=6.6 *15*. I$_\gamma$: 8 (catcher foil spectrum). I$_\gamma$: Composite peak.
x335.5 *2*	13						
350.7 *1*	84	1674.06+x	14^+	1323.34+x	13^+	M1+E2	α(K)exp=0.073 *16* I$_\gamma$: 96 (catcher foil spectrum). K/L=5.2 *15*.

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^{144}Sm(^{14}N,4nγ) 2002Fo07 (continued)

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

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
358.9 *2*	24	3240.45+x		2881.58+x			
383.2 *1*	85	1134.98+x	13^+	751.79+x	11^+	E2	α(K)exp=0.032 *7* I_γ: 62 (catcher foil spectrum). K/L=3.0 *10*.
395.4 *2*	34	4486.26+x	$(23)^+$	4090.77+x			I_γ: Composite peak.
429.3 *2*	56	4486.26+x	$(23)^+$	4056.99+x	(22^+)	M1+E2	α(K)exp=0.044 *13*
471.2 *1*	100	2145.25+x	16^+	1674.06+x	14^+	E2	α(K)exp=0.013 *4* I_γ: 100 (catcher foil spectrum).
498.7 *1*	75	4996.80+x	$(23,24)^+$	4498.11+x	$(21,22)^+$	E2	α(K)exp=0.016 *4*
510.4 *3*	48	4996.80+x	$(23,24)^+$	4486.26+x	$(23)^+$		
577.1 *3*	106	4667.9+x		4090.77+x			I_γ: for 578.2+577.1; 578.2γ component is much stronger than 577.1.
578.2 *1*	106	1323.34+x	13^+	745.12+x	11^+	E2	α(K)exp=0.008 *2* I_γ: for 578.2+577.1; 578.2γ component is much stronger than 577.1. I_γ: 75 (catcher foil spectrum) for composite line.
[x]597.0 *2*	21						
609.6[#] *3*	9	2424.55+x	$(15)^+$	1814.81+x	15^+		
636.2 *2*	72	4056.99+x	(22^+)	3420.87+x	$(20)^+$	E2	α(K)exp=0.008 *3* I_γ: for 639.0γ + 639.2γ.
639.0 *2*	82	1674.06+x	14^+	1035.09+x	12^+		
639.2 *2*	82	2453.99+x	$(16)^+$	1814.81+x	15^+	M1+E2	α(K)exp=0.020 *8* I_γ: for 639.0γ + 639.2γ.
659.6 *2*	46	3409.96+x	$(19)^+$	2750.37+x	$(17)^+$		α(K)exp=0.012 *4* I_γ: 23 (catcher foil spectrum). Mult.: M1+E2 based on α(K)exp contradicts $\Delta J=2$ transition from level scheme.
[x]667.0 *3*	34						
669.6 *3*	14	4090.77+x		3420.87+x	$(20)^+$		
678.1 *3*	177	3420.87+x	$(20)^+$	2742.65+x	$(19)^+$	M1+E2	α(K)exp=0.013 *6* I_γ: for 679.6+678.1; 679.6γ component is much stronger than 577.1.
679.6 *3*	177	1814.81+x	15^+	1134.98+x	13^+	E2	α(K)exp=0.010 *7* I_γ: for 679.6+678.1; 679.6γ component is much stronger than 577.1. I_γ: 49 (catcher foil spectrum) for composite line.
699.2 *3*	6	2514.42+x	$(16)^+$	1814.81+x	15^+		
721.3 *3*	33	3471.61+x	$(19)^+$	2750.37+x	$(17)^+$	E2	α(K)exp=0.008 *4* I_γ: 4 (catcher foil spectrum).
745.1 *1*	100	745.12+x	11^+	0+x	9^+	E2	α(K)exp=0.0064 *24* I_γ: 100 (catcher foil spectrum).
751.8 *1*	102	751.79+x	11^+	0+x	9^+	E2	α(K)exp=0.0084 *26* I_γ: 74 (catcher foil spectrum).
757.7 *2*	73	4498.11+x	$(21,22)^+$	3740.45+x	$(20)^+$	M1+E2	α(K)exp=0.012 *4* I_γ: 65 (catcher foil spectrum); line also in ^{153}Er.
765.5 *2*	133	5974.3+x	$(27,28)^+$	5208.80+x	$(25,26)^+$		I_γ: 50 (catcher foil spectrum); line also in ^{153}Er. I_γ: Composite peak. E_γ: The ordering of the 166.9-765.5-212.0 cascade is tentative due to similar intensities of the γ rays involved, thus the intermediate levels at 5208.8+x and 5974.2+x may be at different energies.
769.0 *3*	20	1035.09+x	12^+	266.10+x	10^+		I_γ: 30 (catcher foil spectrum); line also in ^{153}Er.
802.0 *3*	23	2616.74+x	$(17)^+$	1814.81+x	15^+		I_γ: 17 (catcher foil spectrum).
935.6 *3*	49	2750.37+x	$(17)^+$	1814.81+x	15^+	E2	α(K)exp=0.004 *2* I_γ: 12 (catcher foil spectrum).

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^{144}Sm(^{14}N,4nγ) 2002Fo07 (continued)

γ(^{154}Tm) (continued)

E_γ	I_γ †	E_i(level)	J_i^π	E_f	J_f^π
[x]1142.4 *3*	24				
1175.3 *3*	43	4056.99+x	(22^+)	2881.58+x	
1257.7 *3*	45	4498.11+x	$(21,22)^+$	3240.45+x	
1289.9 *3*	22	2424.55+x	$(15)^+$	1134.98+x	13^+
1348.2 *3*	63	4090.77+x		2742.65+x	$(19)^+$

† Relative intensities in the in-beam spectra. The values from the catcher foil spectrum are given under comments. Uncertainties are ≈10% for strong lines.

‡ From graphical comparison of measured conversion-electron data with calculated values of 2002Fo07 (no numerical values provided).

Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

^{144}Sm(^{14}N,4nγ) 2002Fo07

Level Scheme

Intensities: Relative I_γ

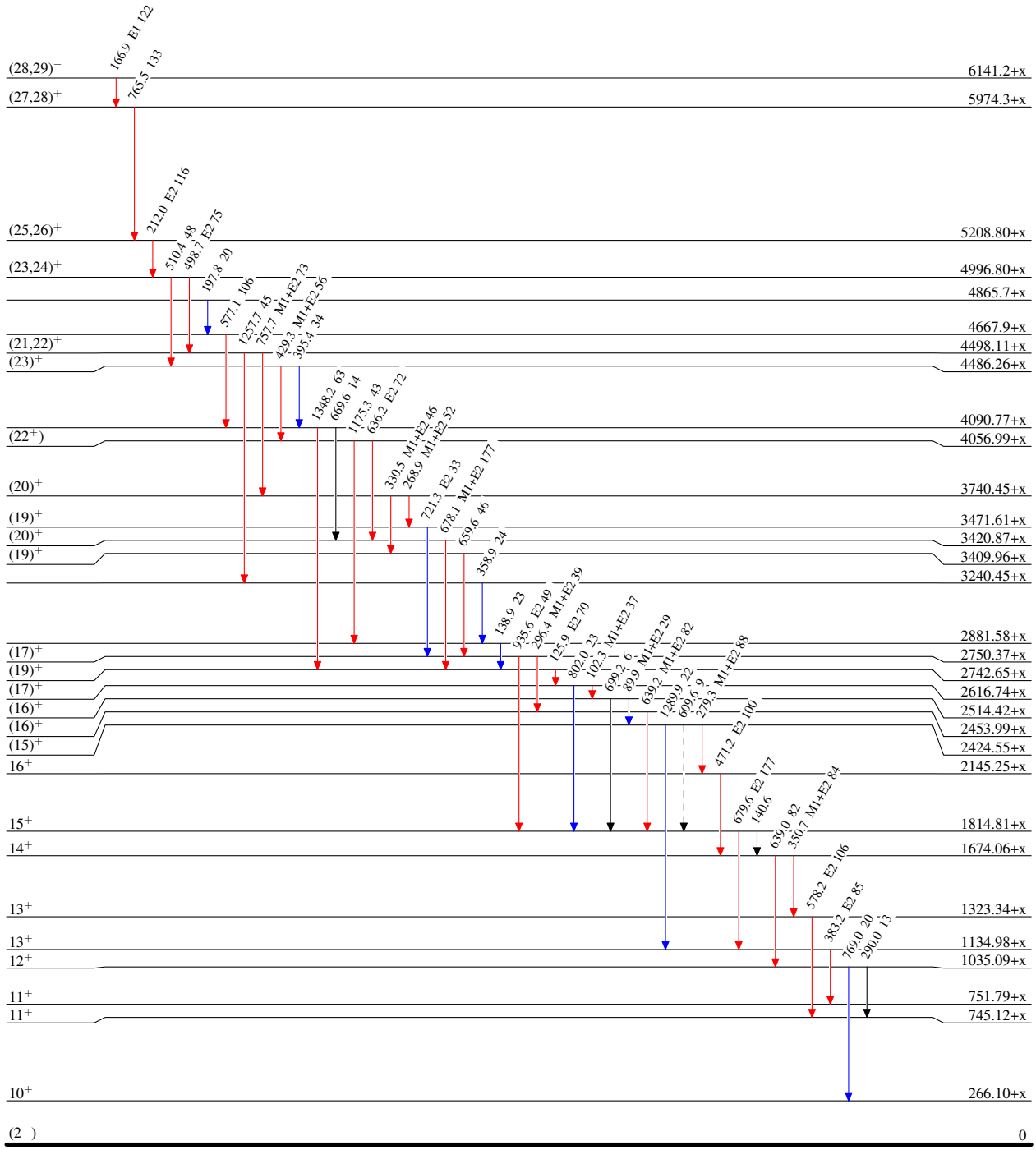
Legend

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

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

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

γ Decay (Uncertain)

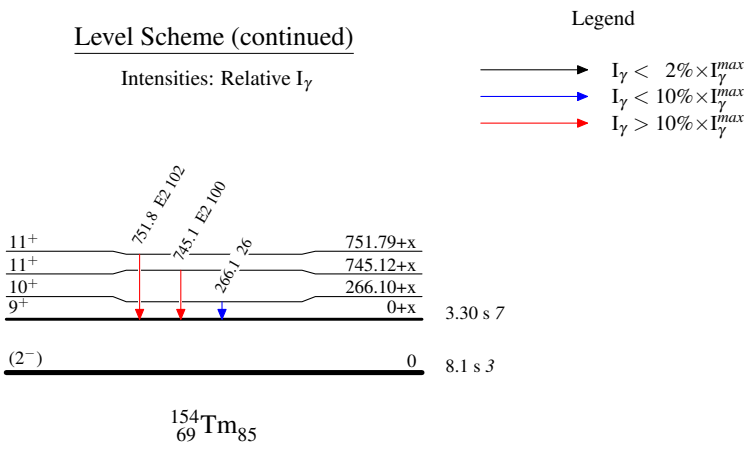


$^{154}_{69}Tm_{85}$

^{144}Sm(^{14}N,4nγ) 2002Fo07

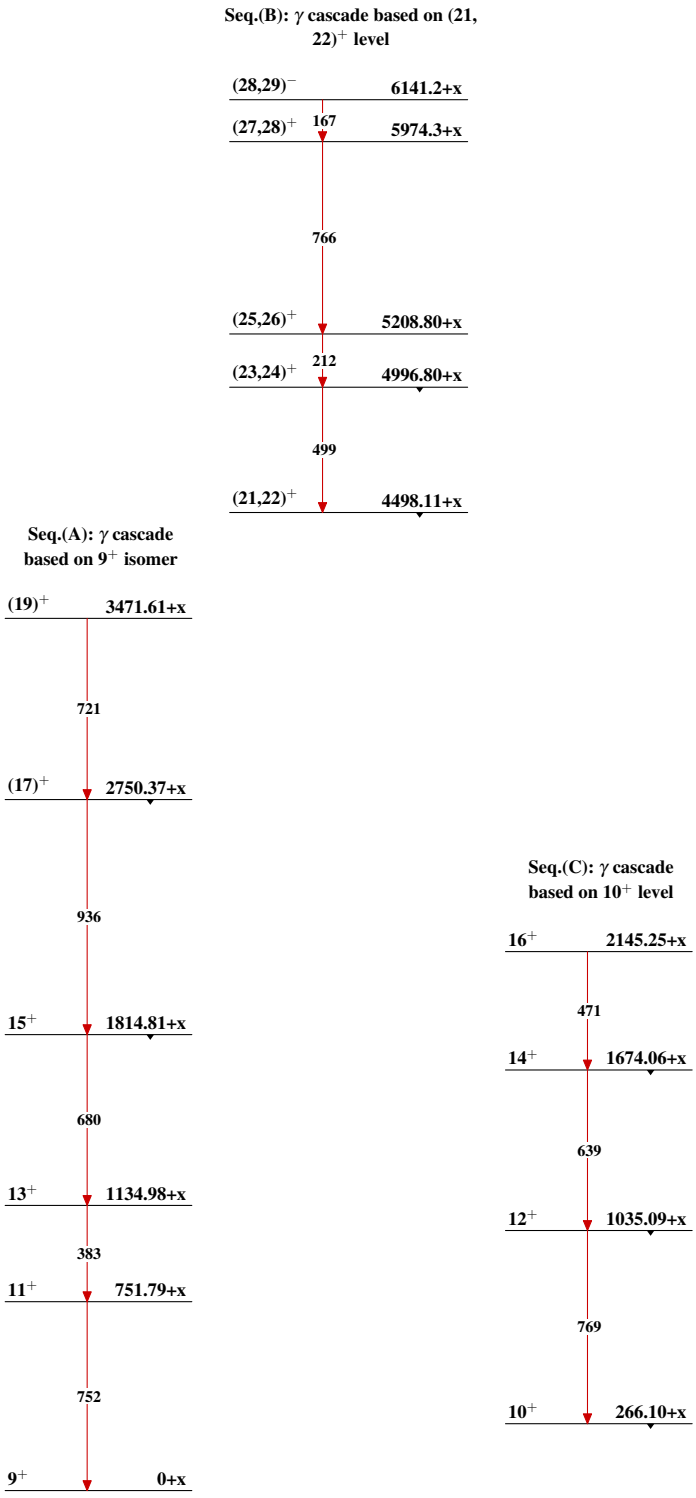
Level Scheme (continued)

Intensities: Relative I_γ



$^{154}_{69}Tm_{85}$

$^{144}Sm(^{14}N,4n\gamma)$ 2002Fo07



$^{154}_{69}Tm_{85}$