

Energy levels and branching ratios [06Ja0A].

¹⁶⁵Tm
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E^*	$2J^\pi$	L	$d\sigma/d\Omega$	S_N	L	$d\sigma/d\Omega$	S_N	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]		(τ, d)	$\mu\text{b/sr}$	(τ, d)	(α, t)	$\mu\text{b/sr}$	(α, t)	Γ_{cm}		E_f^* : $2J_f^\pi$:	0.0 1 ⁺	11.6 3 ⁺	80.4 7 ⁺	129.5 5 ⁺	158.9 7 ⁺
0.0	1 ⁺	$\langle 0 \rangle$			$\langle 0 \rangle$			30.06(3) h	74Ch44						
11.54(6)	3 ⁺	$\langle 2 \rangle$	52.1	$\langle 0.5 \rangle$	$\langle 2 \rangle$	13.5	$\langle 0.6 \rangle$	0.75(5) ns	74Ch44	100					
80.37(6)	7 ⁺	4	14.0	0.62	4	12.5	0.83	80.3(30) μs	74Ch44		100				
129.63(5)	5 ⁺	2	48.5	0.38	2	9.1	0.42	≤ 0.2 ns	74Ch44	14.2(3)	86(4)				
158.20(25)	1 ⁻		27.2			5.2			74Ch44	100					
158.93(12)	7 ⁺		incl	$\langle 1.2 \rangle$			$\langle 0.4 \rangle$	322(20) ps			100			x	
160.47(13)	7 ⁻							9.0(5) μs					97(5)	3.1(5)	
181.72(12)	5 ⁻	3	43.1		3	9.4			74Ch44		100		x		x
210.61(8)	9 ⁺											100			
252.31(7)	9 ⁻														
275.52(7)	3 ⁻	1	47.4		1	3.7			74Ch44	100					
293.56(9)	9 ⁻	5	13.2		5	11.1			74Ch44						92(5)
315.59(6)	5 ⁺	2	153.6	1.14	2	23.0	1.25		74Ch44		57(3)	5.0(4)	31(2)	6.9(7)	
362.26(7)	9 ⁺		30.1	0.03		20.3	0.02		74Ch44				40(2)	60(3)	
366.85(13)	11 ⁺		incl									39(6)			
368.65(12)	11 ⁻		incl												
413.49(12)	11 ⁺														78(6)
415.94(8)	$\langle 3^+ \rangle$									57(5)	≈ 32		10.9(14)		
419.83(7)	7 ⁺											19(6)	14(2)	26(2)	
450.33(9)	7 ⁻	3	19.7		3	7.7			74Ch44				100		
491.23(7)	$\langle 5^+ \rangle$	$\langle 2 \rangle$	≈ 20		$\langle 2 \rangle$	≈ 3			74Ch44		47(3)		35(2)	18(6)	
497.3(1)	13 ⁻														
510.96(15)	13 ⁻														
544.93(14)	13 ⁺														
551.92(12)	9 ⁺													26(3)	
592.25(10)	$\langle 7^+ \rangle$												37(4)	63(4)	
674.97(15)	15 ⁻														
688(2)	$\langle 5^+, 3^+ \rangle$	$\langle 2 \rangle$	25.0		$\langle 2 \rangle$	2.1			74Ch44						
688.92	13 ⁺														
701.67(12)	11 ⁻														
707.48(16)	11 ⁺								06Ja0A						
725.88(12)	$\langle 9^+ \rangle$														49(4)
745.94(14)	15 ⁺														
768.26(14)	15 ⁺														
795.60(14)	17 ⁻														
797.32(9)															
830.89(18)	$\langle 9^- \rangle$														
865.95(17)	17 ⁻														
889.86(23)											71(29)				
891.91(18)	13 ⁺								06Ja0A						
917(2)	$\langle 1^+ \rangle$	0	66.2		0	≈ 1			74Ch44						
921.40(19)	$\langle 5^-, 7 \rangle$								06Ja0A						
967.72(15)	17 ⁺								06Ja0A						
969(2)	11 ⁻	5	32.0		5	10.7			74Ch44						
1012.75(14)															

(continued)

¹⁶⁵Tm
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E^*	$2J^\pi$	L	$d\sigma/d\Omega$	S_N	L	$d\sigma/d\Omega$	S_N	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]		(τ ,d)	$\mu\text{b/sr}$	(τ ,d)	(α ,t)	$\mu\text{b/sr}$	(α ,t)	Γ_{cm}		E_{f}^* :	0.0	11.6	80.4	129.5	158.9
										$2J_{\text{f}}^\pi$:	1 ⁺	3 ⁺	7 ⁺	5 ⁺	7 ⁺
1030.47(14)	15 [−]								06Ja0A						
1037.04(9)	$\langle 7^- \rangle$												78(5)		
1072.12(18)	19 [−]														
1089.68(20)	15 ⁺								06Ja0A						
1101.47(14)	17 ⁺														
1184.95(15)	21 [−]														
1190.49(8)															
1205.17(14)	19 ⁺														
1215.49(14)	19 ⁺														
1251.04(8)	5 [−]											5.6(3)			
1280.93(14)												47(5)			53(6)
1290.01(19)	$\langle 15^- \rangle$								06Ja0A						
1307.73(10)	$\langle 7^+ \rangle$											x			47(5)
1308.49(19)	21 [−]														
1315.02(8)															
1322.23(22)	17 ⁺														
1325.95(10)															
1338(2)	$\langle 1^+ \rangle$	0	72.5		0	<1			74Ch44						
1370.07(10)													x		
1433.83(15)	19 [−]								06Ja0A						
1442.70(17)	$\langle 17^- \rangle$														
1466.15(16)													13(3)		
1466.16(17)	21 ⁺														
1549.80(20)	23 [−]								06Ja0A						
1552.42(24)	19 ⁺								06Ja0A						
1564.74(8)	7													9.9(15)	
1581.75(17)	7 [−]											18(1)	8.7(6)		
1589.71(15)	21 ⁺														
1595.2(3)															
1614.82(18)	$\langle 19^- \rangle$								06Ja0A						
1633.57(19)	$\langle 17^- \rangle$								06Ja0A						
1659.24(15)	25 [−]								06Ja0A						
1728.15(15)	23 ⁺														
1741.07(22)	$\langle 17^+ \rangle$								06Ja0A						
1744.97(16)	23 ⁺														
1753.83(19)	$\langle 19^- \rangle$								06Ja0A						
1807.19(17)	$\langle 21^- \rangle$								06Ja0A						
1827.26(22)	25 [−]								06Ja0A						
1828.6(3)	21 ⁺								06Ja0A						
1846.57(9)	$\langle 7^- \rangle$														
1857.28(20)	$\langle 19^+ \rangle$								06Ja0A						
1899.34(19)	$\langle 21^- \rangle$								06Ja0A						
1903.96(17)	23 [−]								06Ja0A						
1989.51(20)	$\langle 21^+ \rangle$								06Ja0A						
2026.90(17)	25 ⁺														

(continued)

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E^* [keV]	$2J^\pi$	L (τ, d)	$d\sigma/d\Omega$ $\mu\text{b/sr}$	S_N (τ, d)	L (α, t)	$d\sigma/d\Omega$ $\mu\text{b/sr}$	S_N (α, t)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
										E_f^* :	0.0	11.6	80.4	129.5	158.9
										$2J_f^\pi$:	1 ⁺	3 ⁺	7 ⁺	5 ⁺	7 ⁺
2032.25(19)	$\langle 23^- \rangle$														
2067.79(22)	$\langle 23^+ \rangle$								06Ja0A						
2096.18(23)	27^-														
2135.96(19)	25^+														
2138.71(20)	$\langle 23^+ \rangle$								06Ja0A						
2194.8(3)	$\langle 7 \rangle$														
2210.20(22)	29^-														
2257.12(23)	$\langle 25^- \rangle$								06Ja0A						
2304.85(21)	$\langle 25^+ \rangle$								06Ja0A						
2305.31(18)	27^+														
2329.93(17)	27^+														
2378.6(4)	$\langle 25^+ \rangle$								06Ja0A						
2408.46(23)	29^-														
2427.36(19)	27^-								06Ja0A						
2465.78(25)	$\langle 27^- \rangle$								06Ja0A						
2488.50(23)	$\langle 27^+ \rangle$								06Ja0A						
2541.90(21)	$\langle 27^- \rangle$								06Ja0A						
2621.10(18)	29^+														
2662.91(21)	29^+														
2671.2(4)	$\langle 27^+ \rangle$								06Ja0A						
2689.55(24)	$\langle 29^+ \rangle$								06Ja0A						
2692.4(3)	$\langle 29^- \rangle$								06Ja0A						
2694.44(24)	31^-														
2770.8(3)	$\langle 29^- \rangle$								06Ja0A						
2828.45(23)	33^-														
2858.58(21)	31^+														
2893.54(21)	31^+								06Ja0A						
2907.61(25)	$\langle 31^+ \rangle$								06Ja0A						
2934.5(3)	$\langle 31^- \rangle$								06Ja0A						
2999.49(23)	31^-								06Ja0A						
3015.45(24)	33^-														
3098.77(23)	33^+								06Ja0A						
3123.4(3)	$\langle 31^- \rangle$								06Ja0A						
3126.79(22)	33^+								06Ja0A						
3142.5(3)	$\langle 33^+ \rangle$														
3193.2(3)	$\langle 33^- \rangle$								06Ja0A						
3266.86(25)	35^-														
3325.4(3)	35^+								06Ja0A						
3345.0(4)	$\langle 33^- \rangle$								06Ja0A						
3373.67(23)	35^+								06Ja0A						
3393.4(3)	$\langle 35^+ \rangle$								06Ja0A						
3465.2(3)	$\langle 35^- \rangle$								06Ja0A						
3502.7(3)	37^-														
3519.14(24)	37^-								06Ja0A						
3582.1(3)	37^+								06Ja0A						

(continued)

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E^* [keV]	$2J^\pi$	L	$d\sigma/d\Omega$	S_N	L	$d\sigma/d\Omega$	S_N	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
		(τ, d)	$\mu\text{b/sr}$	(τ, d)	(α, t)	$\mu\text{b/sr}$	(α, t)	Γ_{cm}		E_f^* :	0.0	11.6	80.4	129.5	158.9
										$2J_f^\pi$:	1 ⁺	3 ⁺	7 ⁺	5 ⁺	7 ⁺
3618.31(25)	35 ⁻								06Ja0A						
3622.05(24)	37 ⁺								06Ja0A						
3659.3(3)	$\langle 37^+ \rangle$								06Ja0A						
3738.9(4)	$\langle 35^- \rangle$								06Ja0A						
3748.9(4)	$\langle 37^- \rangle$								06Ja0A						
3766.2(3)	39 ⁻								06Ja0A						
3841.0(4)	39 ⁺								06Ja0A						
3905.1(3)	39 ⁺								06Ja0A						
3914.5(4)	$\langle 37^- \rangle$								06Ja0A						
3940.7(3)	$\langle 39^+ \rangle$								06Ja0A						
4038.1(3)	41 ⁻								06Ja0A						
4046.1(4)	$\langle 39^- \rangle$								06Ja0A						
4140.5(4)	41 ⁺								06Ja0A						
4187.4(3)	41 ⁺								06Ja0A						
4219.9(4)	41 ⁻								06Ja0A						
4234.4(3)	$\langle 41^+ \rangle$								06Ja0A						
4276.4(3)	39 ⁻								06Ja0A						
4318.9(3)	43 ⁻								06Ja0A						
4353.0(4)	$\langle 41^- \rangle$								06Ja0A						
4429.4(4)	43 ⁺								06Ja0A						
4510.6(3)	43 ⁺								06Ja0A						
4544.3(3)	$\langle 43^+ \rangle$								06Ja0A						
4633.8(3)	45 ⁻								06Ja0A						
4673.6(5)	$\langle 43^- \rangle$								06Ja0A						
4775.3(4)	45 ⁺								06Ja0A						
4827.2(3)	45 ⁺								06Ja0A						
4862.2(3)	$\langle 45^+ \rangle$								06Ja0A						
4944.0(4)	47 ⁻								06Ja0A						
4961.8(4)	45 ⁻								06Ja0A						
4964.5(4)	$\langle 43^- \rangle$								06Ja0A						
5003.3(5)	$\langle 45^- \rangle$								06Ja0A						
5090.2(5)	47 ⁺								06Ja0A						
5185.4(4)	47 ⁺								06Ja0A						
5203.4(4)	$\langle 47^+ \rangle$								06Ja0A						
5309.1(4)	49 ⁻								06Ja0A						
5347.3(5)	$\langle 47^- \rangle$								06Ja0A						
5483.7(6)	49 ⁺								06Ja0A						
5526.0(4)	$\langle 49^+ \rangle$								06Ja0A						
5550.6(4)	49 ⁺								06Ja0A						
5640.2(4)	51 ⁻								06Ja0A						
5701.2(5)	$\langle 49^- \rangle$								06Ja0A						
5724.6(5)	49 ⁻								06Ja0A						
5819.6(5)	51 ⁺								06Ja0A						
5891.3(4)	$\langle 51^+ \rangle$								06Ja0A						
5931.4(4)	$\langle 51^+ \rangle$								06Ja0A						

(continued)

¹⁶⁵Tm
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E^* [keV]	$2J^\pi$	L (τ ,d)	$d\sigma/d\Omega$ $\mu\text{b/sr}$	S_N (τ ,d)	L (α ,t)	$d\sigma/d\Omega$ $\mu\text{b/sr}$	S_N (α ,t)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
										E_f^* :	0.0	11.6	80.4	129.5	158.9
										$2J_f^\pi$:	1 ⁺	3 ⁺	7 ⁺	5 ⁺	7 ⁺
6060.7(4)	53 ⁻								06Ja0A						
6071.9(5)	$\langle 51^- \rangle$								06Ja0A						
6245.6(4)	$\langle 53^+ \rangle$								06Ja0A						
6263.6(5)	53 ⁺								06Ja0A						
6332.1(5)	$\langle 53^+ \rangle$								06Ja0A						
6402.5(5)	55 ⁻								06Ja0A						
6452.5(6)	$\langle 53^- \rangle$								06Ja0A						
6520.9(5)	53 ⁻								06Ja0A						
6613.5(6)	55 ⁺								06Ja0A						
6883.6(5)	57 ⁻								06Ja0A						
7109.9(6)	57 ⁺								06Ja0A						
7228.8(5)	59 ⁻								06Ja0A						
7481.3(6)	59 ⁺								06Ja0A						
7774.2(5)	61 ⁻								06Ja0A						
8023.3(6)	61 ⁺								06Ja0A						
8112.0(6)	63 ⁻								06Ja0A						
8410.2(7)	63 ⁺								06Ja0A						
8731.0(6)	65 ⁻								06Ja0A						
8997.6(8)	$\langle 65^+ \rangle$								06Ja0A						
9053.5(7)	67 ⁻								06Ja0A						
9405.6(9)	$\langle 67^+ \rangle$								06Ja0A						
10050.9(13)	71 ⁻								06Ja0A						

 σ (τ ,d) and σ (α ,t) were measured at 50° and 60°. S_N =Nuclear Structure Factor= $d\sigma/d\Omega_{\text{exp}}/2Nd\sigma/d\Omega_{DWBA}$ [74Ch44, 06Ja0A].

18 bands of levels are suggested in [06Ja0A].

Data for this isotope are considered in vol. LB I/18C.

Energy levels and branching ratios [06Ja0A]. Part 2

¹⁶⁵Tm
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E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* :	160.47	181.72	210.59	252.44	293.52	315.54	362.28	366.9	370.2	414.2
		$2J_f^\pi$:	7 ⁻	5 ⁻	9 ⁺	9 ⁻	9 ⁻	5 ⁺	9 ⁺	11 ⁺	11 ⁻	11 ⁺
<hr/>												
252.31(7)	9 ⁻		100									
293.56(9)	9 ⁻			8.2(14)								
366.85(13)	11 ⁺				61(18)							
368.65(12)	11 ⁻		14(4)			86(11)						
413.49(12)	11 ⁺						22(3)					
419.83(7)	7 ⁺							41(5)				
497.3(1)	13 ⁻						87(10)					12.7(13)
510.96(15)	13 ⁻					16.3(23)					84(6)	
544.93(14)	13 ⁺				76(11)					24(4)		
674.97(15)	15 ⁻										36(4)	

(continued)

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E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	160.47 7 ⁻	181.72 5 ⁻	210.59 9 ⁺	252.44 9 ⁻	293.52 9 ⁻	315.54 5 ⁺	362.28 9 ⁺	366.9 11 ⁺	370.2 11 ⁻	414.2 11 ⁺
688.92	13 ⁺								49(10)			51(13)
725.88(12)	$\langle 9^+ \rangle$								36(5)			16(2)
745.94(14)	15 ⁺									77(12)		
768.26(14)	15 ⁺									9(4)		73(6)
797.32(9)			77(5)			23(4)						
830.89(18)	$\langle 9^- \rangle$					100						
889.86(23)				18(6)					11(2)			
921.40(19)	$\langle 5^-, 7 \rangle$			46(6)			13(4)	41(6)				
1012.75(14)				83(8)					17(3)			
1037.04(9)	$\langle 7^- \rangle$		7.2(38)		13.5(11)		1.1(5)					
1190.49(8)			85(5)	3.0(15)		11.7(13)						
1251.04(8)	5 ⁻		84(5)			≈ 2.4		8.0(5)				
1307.73(10)	$\langle 7^+ \rangle$			39(5)								14(6)
1315.02(8)			40(3)					≈ 44				
1325.95(10)			25(2)			≈ 63	4(2)	2.4(12)				
1370.07(10)			12(5)	24(3)		36(4)						
1466.15(16)							18(6)					
1564.74(8)	7		3.7(6)			13.2(10)		3.6(19)	11.9(12)			
1581.75(17)	7 ⁻		9.7(6)		4.4(4)	11.1(8)		6.5(5)	15(1)			
1846.57(9)	$\langle 7^- \rangle$		7.5(13)					10.3(11)				
2194.8(3)	$\langle 7 \rangle$					37(6)						

Energy levels and branching ratios [06Ja0A]. Part 3

 $^{165}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	419.79 7 ⁺	450.31 7 ⁻	491.23 5 ⁺	498.4 13 ⁻	512.7 13 ⁻	546.1 13 ⁺	552.00 9 ⁺	592.25 7 ⁺	676.9 15 ⁻	689.9 13 ⁺
551.92(12)	9 ⁺		74(18)									
674.97(15)	15 ⁻						64(8)					
745.94(14)	15 ⁺							23(5)				
768.26(14)	15 ⁺					18(4)						
795.60(14)	17 ⁻					100						
865.95(17)	17 ⁻						58(6)				42(5)	
1072.12(18)	19 ⁻										52(8)	
1101.47(14)	17 ⁺											32(8)
1315.02(8)			12(3)							4(2)		
1325.95(10)			6(3)									
1370.07(10)					24(9)							
1466.15(16)				50(9)								
1564.74(8)	7		10(1)		29				5.8(19)			
1581.75(17)	7 ⁻		2.9(3)		≈ 3					2.4(6)		
1846.57(9)	$\langle 7^- \rangle$		15.0(19)						9.3(32)			

Energy levels and branching ratios [06Ja0A]. Part 4

¹⁶⁵Tm
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E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	725.88 9 ⁺	747.2 15 ⁺	769.5 15 ⁺	796.9 17 ⁻	797.34 $\langle 9^- \rangle$	830.98 17 ⁻	868.0 17 ⁻	969.0 17 ⁺	969 $\langle 11 \rangle^-$	1037.02 $\langle 7^- \rangle$
1072.12(18)	19 ⁻								48(7)			
1101.47(14)	17 ⁺				68(9)							
1184.95(15)	21 ⁻					100						
1205.17(14)	19 ⁺				63(13)	37(8)				x		
1215.49(14)	19 ⁺			29(8)	46(9)	25(8)						
1308.49(19)	21 ⁻								48(10)			
1370.07(10)		5(1)										
1466.16(17)	21 ⁺										94(18)	
1564.74(8)	7	5.9(10)										1.9(4)
1581.75(17)	7 ⁻	3.0(3)					6.3(5)					
1595.2(3)												31(10)
1846.57(9)	$\langle 7^- \rangle$							12.2(24)				

Energy levels and branching ratios [06Ja0A]. Part 5

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E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	1074.5 19 ⁻	1103.5 17 ⁺	1186.6 21 ⁻	1190.50 19 ⁺	1207.0 19 ⁺	1216.9 19 ⁺	1250.82 5 ⁻	1311.0 21 ⁻	1466.20 21 ⁺	1467.9 21 ⁺
1308.49(19)	21 ⁻	52(7)										
1466.15(16)						≈ 19						
1466.16(17)	21 ⁺						6.2(26)					
1552.42(24)	19 ⁺	62(12)								38(7)		
1564.74(8)	7								4.5(6)			
1581.75(17)	7 ⁻					9.1(12)						
1589.71(15)	21 ⁺			100				x				
1595.2(3)						69						
1659.24(15)	25 ⁻				100							
1728.15(15)	23 ⁺				x		100					
1744.97(16)	23 ⁺				51(12)			49(15)				
1827.26(22)	25 ⁻									62(12)		
1846.57(9)	$\langle 7^- \rangle$					46(3)						
2026.90(17)	25 ⁺											100
2194.8(3)	$\langle 7 \rangle$										27(7)	

Energy levels and branching ratios [06Ja0A]. Part 6

¹⁶⁵Tm
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E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	1552.5 23 [−]	1591.7 21 ⁺	1595.4	1661.3 25 [−]	1730.8 23 ⁺	1747.0 23 ⁺	1830.3 25 [−]	2029.2 25 ⁺	2099.4 27 [−]	2138.6 25 ⁺

1827.26(22)	25 [−]		38(9)									
2096.18(23)	27 [−]		70(13)					30(6)				
2138.71(20)	⟨23 ⁺ ⟩			100								
2194.8(3)	⟨7⟩				35(7)							
2210.20(22)	29 [−]					100						
2305.31(18)	27 ⁺					x	x					
2329.93(17)	27 ⁺					x		x				
2408.46(23)	29 [−]								x		x	
2621.10(18)	29 ⁺									100		
2662.91(21)	29 ⁺											100
2694.44(24)	31 [−]										85(20)	

Energy levels and branching ratios [06Ja0A]. Part 7

¹⁶⁵Tm
69

E^* [keV]	$2J^\pi$	Branching ratios in percentage							
		E_f^* : $2J_f^\pi$:	2212.8 29 ⁻	2308.5 27 ⁺	2411.4 29 ⁻	2624.1 29 ⁺	2698.2 31 ⁻	2831.5 33 ⁻	3019.3 33 ⁻
2694.44(24)	31 ⁻				15(8)				
2828.45(23)	33 ⁻		100						
2858.58(21)	31 ⁺			100					
3015.45(24)	33 ⁻				61(15)		39(9)		
3142.5(3)	⟨33 ⁺ ⟩					100			
3266.86(25)	35 ⁻						x		x
3502.7(3)	37 ⁻							100	

Energy levels [92Sh13].

¹⁶⁶Tm
69

E^* [keV]	J^π	$T_{1/2}$ or Γ_{cm}
0.0	2 ⁺	7.70(3) h
82.29(2)	1 ⁺	<3 ns

Additional data on this isotope can be found in [02Ca46, 96Dr07, 92Dr03].

High-spin states assigned to 11 bands are described in [02Ca46], $T_{1/2}$ =340 ms for 6⁻ isomer was taken there from [96Dr07]; adopted in [92Sh13] level scheme is incomplete.

Energy levels and branching ratios [00Ba65].

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	L	S_N	σ (τ, d) $\mu\text{b/sr}$	S_N	σ (α, t) $\mu\text{b/sr}$	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
									E_f^* : $2J_f^\pi$:	0.0 1^+	10.4 3^+	116.6 5^+	142 7^+	171 $\langle 1 \rangle^-$
0.0	1^+			41.2		20.2	9.25(2) d	74Ch44						
10.400(19)	3^+		$\langle 0.66 \rangle$	incl	$\langle 0.57 \rangle$	incl	0.95(5) ns	74Ch44	100					
116.575(18)	5^+		0.37	34.9	0.29	10.7	66(7) ps	74Ch44	11.1(3)	89(4)				
142.424(20)	7^+		0.22	2.1	0.12	2.6	343(15) ps	74Ch44		98(3)	1.6(5)			
171.73(4)	$\langle 1 \rangle^-$			73.5		37.4		74Ch44	52(14)	48(14)				
179.480(19)	$\langle 7 \rangle^+$		$\langle 3.7 \rangle$	incl	$\langle 1.76 \rangle$	incl	1.16(6) μs	74Ch44		3.0(3)	93(16)	3.6(12)		
187.642(22)	5^-			incl		incl				100				
282.21(4)	$\langle 3 \rangle$			44.7		23.0		74Ch44	76(15)	24(8)				x
285.891(21)	$\langle 9 \rangle^-$		<2.1	incl		incl		74Ch44				97(3)		
290.91(4)	$\langle 3^- \rangle$			incl		incl			61(7)	6.6(15)	14(6)			
292.820(20)	7^-			incl		incl	0.9(1) μs				27	0.048(14)		
296.205(22)	$\langle 9 \rangle^+$										x			
326.464(23)	9^+			≈ 2		≈ 1		74Ch44			30.8(8)	69(3)		
370.996(22)	$\langle 11^+ \rangle$											x		
383.661(22)	$\langle 9^- \rangle$													
436.047(21)	$\langle 11 \rangle^+$													
459.87(4)	7^-	0.10		11.5		5.3		74Ch44			x			
470.205(23)	$\langle 13^- \rangle$													
470.72(7)	3^+	0.04		5.3	0.05	1.2		74Ch44	44(6)	52(7)	5(3)			
496.593(25)	11^-	0.86		7.8		13.0		74Ch44						
522.25(5)	5^+	1.17		101.4	0.85	23.2		74Ch44		x	77(11)	23(8)		
557.92(5)	5^+	0.33		37.3	0.29	7.8		74Ch44		45(7)	40(8)	15(4)		
597.456(22)	$\langle 13 \rangle^+$													
602.00(5)	$\langle 7 \rangle^+$			3.9		≈ 1		74Ch44			[85(15)]	<52		
622.044(23)	$\langle 13^+ \rangle$													
631.774(24)	$\langle 13^- \rangle$													
657.46(10)	$\langle 7^+ \rangle$										x	x		
663														
682														
689.131(24)	$\langle 15^+ \rangle$													
699.12(4)	$\langle 11^- \rangle$			3.2		2.4		74Ch44						
706														
709.12(5)	$\langle 9^+ \rangle$			3.7				74Ch44				11(2)		
717(2)														
741.314(25)	$\langle 17^- \rangle$													
771(2)				10.5		2.5		74Ch44						
778.94(3)	$\langle 15^+ \rangle$													
780.44(5)	$\langle 9^+ \rangle$													
787.77(3)	$\langle 15^- \rangle$													
840.19(4)	$\langle 11^+ \rangle$													
852.59(17)	$\langle 3^- \rangle$													[100]
867.76(14)	$\langle 5^+, 7 \rangle$													
882.10(18)	$\langle 5^- \rangle$													
927.85(5)	$\langle 11^+ \rangle$													
929.71(7)	$\langle 9^- \rangle$													

(continued)

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	L	S_N (τ, d)	σ (τ, d) $\mu\text{b/sr}$	S_N (α, t)	σ (α, t) $\mu\text{b/sr}$	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
									E_f^* :	0.0	10.4	116.6	142	171
									$2J_f^\pi$:	1 ⁺	3 ⁺	5 ⁺	7 ⁺	(1) ⁻
935.25(5)	$\langle 7^- \rangle$													
944.85(4)	$\langle 11^+ \rangle$													
965.73(3)	$\langle 17^- \rangle$													
978.471(24)	$\langle 17^+ \rangle$													
993.553(25)	$\langle 17^+ \rangle$													
1001.14(4)	$\langle 13^+ \rangle$													
1007.57(3)	$\langle 15^- \rangle$													
1008.50(4)	$\langle 9^- \rangle$													
1044.02(6)	11 ⁻		0.88	11.2		14.1		74Ch44						
1086.511(25)	$\langle 19^+ \rangle$													
1092														
1096.17(3)	$\langle 21^- \rangle$													
1096.43(4)	$\langle 13^+ \rangle$													
1101.32(4)	$\langle 13^+ \rangle$													
1105.28(4)	$\langle 11^- \rangle$													
1125(2)	1 ⁺	0		45.2		≈ 1		74Ch44						
1154														
1160.91(3)	$\langle 19^- \rangle$													
1163.94(6)	$\langle 15^+ \rangle$													
1168(2)				7.7				74Ch44						
1192														
1194.74(3)	$\langle 19^+ \rangle$													
1210														
1216.54(6)	$\langle 7^+ \rangle$													
1223.06(4)	$\langle 13^- \rangle$													
1229.85(10)	$\langle 7^- \rangle$													
1235(2)				7.9				74Ch44						
1276.79(4)	$\langle 15^+ \rangle$													
1281.38(7)	$\langle 15^+ \rangle$													
1283														
1320														
1358.69(4)	$\langle 15^- \rangle$													
1372.67(4)	$\langle 17^+ \rangle$													
1374(2)				12.0				74Ch44						
1378.15(3)	$\langle 21^- \rangle$													
1380														
1381.00(4)	$\langle 19^- \rangle$													
1403(2)	1 ⁺	0		121.2		≈ 1		74Ch44						
1424.58(4)	$\langle 21^+ \rangle$													
1429.49(4)	$\langle 21^+ \rangle$													
1432.31(10)	$\langle 5^-, 7 \rangle$													
1457														
1470.19(6)	$\langle 17^+ \rangle$													
1486														
1487.31(8)	$\langle 17^+ \rangle$													

(continued)

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	L	S_N	σ (τ, d)	S_N	σ (α, t)	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, d)	$\mu\text{b/sr}$	(α, t)	$\mu\text{b/sr}$	Γ_{cm}		E_f^* :	0.0	10.4	116.6	142	171
									$2J_f^\pi$:	1 ⁺	3 ⁺	5 ⁺	7 ⁺	$\langle 1 \rangle^-$
1524.87(4)	$\langle 17^- \rangle$													
1527.43(7)	$\langle 5^- \rangle$	$\langle 3 \rangle$		51.2		8.0		74Ch44			4.8(9)	1.6(6)	4.6(10)	
1528.64(4)	$\langle 25^- \rangle$													
1549(2)				5.0				74Ch44						
1549.97(4)	$\langle 23^+ \rangle$													
1562.85(5)	$\langle 19^+ \rangle$													
1574														
1580.92(6)	5 ⁺ , 7 ⁺			8.3				74Ch44			23(4)	5(1)	17(3)	
1597.56(7)	$\langle 5^-, 7^+ \rangle$			5.3				74Ch44			30(4)	3(1)	25(4)	
1606.73(5)	$\langle 23^- \rangle$													
1625														
1629.75(14)	5, 7 ⁺			4.7				74Ch44			50(7)		38(9)	
1644(2)				12.2				74Ch44						
1654.30(9)	5, 7 ⁺										30(4)	6(3)	26(4)	
1668.84(4)	$\langle 23^+ \rangle$													
1672(2)				5.2				74Ch44						
1678.84(5)	$\langle 19^+ \rangle$													
1691.19(4)	$\langle 19^- \rangle$													
1701(2)				27.2				74Ch44						
1705.48(6)	$\langle 19^+ \rangle$													
1718(2)				30.6				74Ch44						
1808.63(4)	$\langle 23^- \rangle$													
1813.88(5)	$\langle 21^+ \rangle$													
1858.57(6)	$\langle 25^- \rangle$													
1901.18(9)	$\langle 21^+ \rangle$													
1915.33(5)	$\langle 25^+ \rangle$													
1916.55(6)	$\langle 21^- \rangle$													
1922.37(6)	$\langle 25^+ \rangle$													
2022.19(9)	$\langle 23^+ \rangle$													
2030.73(6)	$\langle 29^- \rangle$													
2065.53(15)	$\langle 27^+ \rangle$													
2098.02(6)	$\langle 23^- \rangle$													
2113.72(8)	$\langle 27^- \rangle$													
2135.88(7)	$\langle 23^+ \rangle$													
2186.37(5)	$\langle 27^+ \rangle$													
2279.64(8)	$\langle 27^- \rangle$													
2321.02(7)	$\langle 25^+ \rangle$													
2381.98(18)	$\langle 25^+ \rangle$													
2394.35(6)	$\langle 29^- \rangle$													
2396.38(8)	$\langle 25^- \rangle$													
2440.40(7)	$\langle 29^+ \rangle$													
2455.56(9)	$\langle 29^+ \rangle$													
2573.24(16)	$\langle 27^- \rangle$													
2593.41(13)	$\langle 33^- \rangle$													
2620.20(13)	$\langle 31^+ \rangle$													

(continued)

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	L	S_N	σ (τ, d)	S_N	σ (α, t)	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, d)	$\mu\text{b/sr}$	(α, t)	$\mu\text{b/sr}$	Γ_{cm}		E_f^* :	0.0	10.4	116.6	142	171
									$2J_f^\pi$:	1 ⁺	3 ⁺	5 ⁺	7 ⁺	(1) ⁻
2670.48(9)	$\langle 31^- \rangle$													
2735.76(9)	$\langle 31^+ \rangle$													
2799.01(22)	$\langle 31^- \rangle$													
			00Ba65	74Ch44	74Ch44	74Ch44		Ref.						
			74Ch44											

Additional data on this isotope can be found in [73Go14].

 σ (τ, d) and σ (α, t) were measured at 30° and 45°, respectively; see data for 60° in [74Ch44]. $S_N = d\sigma/d\Omega_{\text{exp}}/N \times d\sigma/d\Omega_{\text{theory}}$ with $N=4.42$ [00Ba65, 74Ch44] (see also ^{165}Tm).

Data for this isotope are considered in vol. LB I/18C.

Energy levels and branching ratios [00Ba65]. Part 2

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage											
[keV]		E_f^* :	179	188	282.21	285.891	290.91	292.820	296.205	326.464	370.996	383.661	
		$2J_f^\pi$:	$\langle 7 \rangle^+$	5 ⁻	$\langle 3 \rangle$	$\langle 9 \rangle^-$	$\langle 3^- \rangle$	7 ⁻	$\langle 9 \rangle^+$	9 ⁺	$\langle 11^+ \rangle$	$\langle 9^- \rangle$	
282.21(4)	$\langle 3 \rangle$			x									
285.891(21)	$\langle 9^- \rangle$			3.4(3)									
290.91(4)	$\langle 3^- \rangle$			18(7)									
292.820(20)	7 ⁻		72(3)	0.8(1)		x							
296.205(22)	$\langle 9 \rangle^+$		100										
370.996(22)	$\langle 11^+ \rangle$					x				x			
383.661(22)	$\langle 9^- \rangle$							100					
436.047(21)	$\langle 11 \rangle^+$		43.6(8)						56(3)				
459.87(4)	7 ⁻			x		x	x						
470.205(23)	$\langle 13^- \rangle$					72(2)					28(2)		
496.593(25)	11 ⁻							10.0(5)				90(7)	
597.456(22)	$\langle 13 \rangle^+$								61.7(11)				
602.00(5)	$\langle 7 \rangle^+$									x			
622.044(23)	$\langle 13^+ \rangle$									100	<85		
631.774(24)	$\langle 13^- \rangle$											20.4(9)	
657.46(10)	$\langle 7^+ \rangle$									x			
689.131(24)	$\langle 15^+ \rangle$										76(3)		
699.12(4)	$\langle 11^- \rangle$					54(8)				x			
709.12(5)	$\langle 9^+ \rangle$									11(6)	13(4)		
780.44(5)	$\langle 9^+ \rangle$									100			
840.19(4)	$\langle 11^+ \rangle$									33(4)	44(11)		
867.76(14)	$\langle 5^+, 7 \rangle$		52(15)	19(6)					29(6)				
882.10(18)	$\langle 5^- \rangle$			100									
927.85(5)	$\langle 11^+ \rangle$									[81(10)]			
929.71(7)	$\langle 9^- \rangle$							100					
935.25(5)	$\langle 7^- \rangle$			[15(4)]		[85(27)]							
944.85(4)	$\langle 11^+ \rangle$		51(5)							24(5)			

(continued)

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	179 $\langle 7 \rangle^+$	188 5^-	282.21 $\langle 3 \rangle$	285.891 $\langle 9 \rangle^-$	290.91 $\langle 3 \rangle^-$	292.820 7^-	296.205 $\langle 9 \rangle^+$	326.464 9^+	370.996 $\langle 11 \rangle^+$	383.661 $\langle 9 \rangle^-$
1001.14(4)	$\langle 13 \rangle^+$										[79(6)]	
1008.50(4)	$\langle 9 \rangle^-$				100							
1044.02(6)	11^-							<45				39(4)
1096.43(4)	$\langle 13 \rangle^+$										39(6)	
1101.32(4)	$\langle 13 \rangle^+$								78(6)			
1105.28(4)	$\langle 11 \rangle^-$				x							
1216.54(6)	$\langle 7 \rangle^+$		83(11)					0.8(3)	16(2)			
1229.85(10)	$\langle 7 \rangle^-$		47(12)					8(3)	7(2)			16(3)
1432.31(10)	$\langle 5^-, 7 \rangle$							76(12)				24(12)
1527.43(7)	$\langle 5 \rangle^-$			2.3(8)				87(10)				
1580.92(6)	$5^+, 7^+$		2(1)	5(1)	2(1)			27(4)		2(1)		
1597.56(7)	$\langle 5^-, 7^+ \rangle$							36(5)				7(2)
1629.75(14)	$5, 7^+$							12(6)				
1654.30(9)	$5, 7^+$							37(7)				

Energy levels and branching ratios [00Ba65]. Part 3

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	436.047 $\langle 11 \rangle^+$	459.87 7^-	470.205 $\langle 13 \rangle^-$	470.72 3^+	496.593 11^-	522.25 5^+	557.92 5^+	597.456 $\langle 13 \rangle^+$	602.00 $\langle 7 \rangle^+$	622.044 $\langle 13 \rangle^+$
557.92(5)	5^+							x				
597.456(22)	$\langle 13 \rangle^+$		38.3(15)									
602.00(5)	$\langle 7 \rangle^+$							[15(3)]				
631.774(24)	$\langle 13 \rangle^-$						80(4)					
689.131(24)	$\langle 15 \rangle^+$				19.1(5)							5(2)
699.12(4)	$\langle 11 \rangle^-$			46(3)	x							
709.12(5)	$\langle 9 \rangle^+$							26(9)			38(19)	
741.314(25)	$\langle 17 \rangle^-$				100							
778.94(3)	$\langle 15 \rangle^+$									[100]		
780.44(5)	$\langle 9 \rangle^+$								<12			
787.77(3)	$\langle 15 \rangle^-$						32(2)					
840.19(4)	$\langle 11 \rangle^+$										22(2)	<32
927.85(5)	$\langle 11 \rangle^+$											[19(5)]
944.85(4)	$\langle 11 \rangle^+$		24(5)									
978.471(24)	$\langle 17 \rangle^+$									77.3(16)		3.9(7)
1007.57(3)	$\langle 15 \rangle^-$				29(2)							41(2)
1044.02(6)	11^-						<53					
1096.43(4)	$\langle 13 \rangle^+$											x
1101.32(4)	$\langle 13 \rangle^+$		<69							22(6)		
1105.28(4)	$\langle 11 \rangle^-$				x							
1163.94(6)	$\langle 15 \rangle^+$											31(8)
1223.06(4)	$\langle 13 \rangle^-$				x							

(continued)

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	436.047 $\langle 11 \rangle^+$	459.87 7^-	470.205 $\langle 13^- \rangle$	470.72 3^+	496.593 11^-	522.25 5^+	557.92 5^+	597.456 $\langle 13 \rangle^+$	602.00 $\langle 7 \rangle^+$	622.044 $\langle 13^+ \rangle$
1229.85(10)	$\langle 7^- \rangle$						8(2)	4(2)	10(2)			
1276.79(4)	$\langle 15^+ \rangle$		23(2)							24(2)		
1281.38(7)	$\langle 15^+ \rangle$											7(1)
1358.69(4)	$\langle 15^- \rangle$				28(4)							
1470.19(6)	$\langle 17^+ \rangle$									31(4)		
1580.92(6)	$5^+, 7^+$					8(2)			9(2)			

Energy levels and branching ratios [00Ba65]. Part 4

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	631.774 $\langle 13^- \rangle$	657.46 $\langle 7^+ \rangle$	689.131 $\langle 15^+ \rangle$	699.12 $\langle 11^- \rangle$	709.12 $\langle 9^+ \rangle$	741.314 $\langle 17^- \rangle$	778.94 $\langle 15^+ \rangle$	780.44 $\langle 9^+ \rangle$	787.77 $\langle 15^- \rangle$	840.19 $\langle 11^+ \rangle$
787.77(3)	$\langle 15^- \rangle$		68(3)									
840.19(4)	$\langle 11^+ \rangle$						<80					
927.85(5)	$\langle 11^+ \rangle$			x								
965.73(3)	$\langle 17^- \rangle$		40(4)								60(2)	
978.471(24)	$\langle 17^+ \rangle$								18.8(10)			
993.553(25)	$\langle 17^+ \rangle$				[100]							
1001.14(4)	$\langle 13^+ \rangle$				[21(3)]		x					x
1007.57(3)	$\langle 15^- \rangle$					23(2)		7.5(8)				
1086.511(25)	$\langle 19^+ \rangle$				78.5(15)			21.5(5)				
1096.17(3)	$\langle 21^- \rangle$							100				
1096.43(4)	$\langle 13^+ \rangle$			x						9(2)		
1160.91(3)	$\langle 19^- \rangle$										59.7(15)	
1163.94(6)	$\langle 15^+ \rangle$			x								16(3)
1194.74(3)	$\langle 19^+ \rangle$								87(2)			
1223.06(4)	$\langle 13^- \rangle$					x						
1276.79(4)	$\langle 15^+ \rangle$								<51			
1281.38(7)	$\langle 15^+ \rangle$			x								
1358.69(4)	$\langle 15^- \rangle$							72(7)				
1372.67(4)	$\langle 17^+ \rangle$				[68(7)]							
1381.00(4)	$\langle 19^- \rangle$							42(2)				
1470.19(6)	$\langle 17^+ \rangle$								x			
1487.31(8)	$\langle 17^+ \rangle$			20(3)								
1524.87(4)	$\langle 17^- \rangle$							x				
1691.19(4)	$\langle 19^- \rangle$							21(1)				
1705.48(6)	$\langle 19^+ \rangle$				23(4)							

Energy levels and branching ratios [00Ba65]. Part 5

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	927.85 $\langle 11^+ \rangle$	929.71 $\langle 9^- \rangle$	944.85 $\langle 11^+ \rangle$	965.73 $\langle 17^- \rangle$	978.471 $\langle 17^+ \rangle$	993.553 $\langle 17^+ \rangle$	1001.14 $\langle 13^+ \rangle$	1007.57 $\langle 15^- \rangle$	1086.51 $\langle 19^+ \rangle$	1096.17 $\langle 21^- \rangle$
1044.02(6)	11^-			61(25)								
1096.43(4)	$\langle 13^+ \rangle$		52(4)									
1101.32(4)	$\langle 13^+ \rangle$				x							
1160.91(3)	$\langle 19^- \rangle$					40.3(13)						
1163.94(6)	$\langle 15^+ \rangle$								54(3)			
1194.74(3)	$\langle 19^+ \rangle$						13.2(17)					
1276.79(4)	$\langle 15^+ \rangle$				18(2)							
1281.38(7)	$\langle 15^+ \rangle$		37(13)					10(3)				47(17)
1372.67(4)	$\langle 17^+ \rangle$										[32(10)]	
1378.15(3)	$\langle 21^- \rangle$					55.6(13)						
1381.00(4)	$\langle 19^- \rangle$							22(1)		30(10)		6(1)
1424.58(4)	$\langle 21^+ \rangle$						78(39)	<15				
1429.49(4)	$\langle 21^+ \rangle$						[3(1)]	[97(3)]				
1470.19(6)	$\langle 17^+ \rangle$						x					
1487.31(8)	$\langle 17^+ \rangle$										17(6)	
1524.87(4)	$\langle 17^- \rangle$									x		
1528.64(4)	$\langle 25^- \rangle$											100
1549.97(4)	$\langle 23^+ \rangle$										x	x
1562.85(5)	$\langle 19^+ \rangle$							<37			51(9)	
1678.84(5)	$\langle 19^+ \rangle$						43(5)					
1691.19(4)	$\langle 19^- \rangle$											49(3)
1705.48(6)	$\langle 19^+ \rangle$										42(8)	
1808.63(4)	$\langle 23^- \rangle$											61(3)
1813.88(5)	$\langle 21^+ \rangle$										x	
1916.55(6)	$\langle 21^- \rangle$											x

Energy levels and branching ratios [00Ba65]. Part 6

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	1096.43 $\langle 13^+ \rangle$	1101.32 $\langle 13^+ \rangle$	1105.28 $\langle 11^- \rangle$	1160.91 $\langle 19^- \rangle$	1163.94 $\langle 15^+ \rangle$	1194.74 $\langle 19^+ \rangle$	1223.06 $\langle 13^- \rangle$	1276.79 $\langle 15^+ \rangle$	1281.38 $\langle 15^+ \rangle$	1358.69 $\langle 15^- \rangle$
1276.79(4)	$\langle 15^+ \rangle$			34(2)								
1358.69(4)	$\langle 15^- \rangle$				<42							
1372.67(4)	$\langle 17^+ \rangle$						<68					
1378.15(3)	$\langle 21^- \rangle$					44(2)						
1424.58(4)	$\langle 21^+ \rangle$							22(1)				
1470.19(6)	$\langle 17^+ \rangle$			29(4)						39(2)		
1487.31(8)	$\langle 17^+ \rangle$		26(6)								37(6)	
1524.87(4)	$\langle 17^- \rangle$								x			
1562.85(5)	$\langle 19^+ \rangle$						28(7)					
1606.73(5)	$\langle 23^- \rangle$					x						
1668.84(4)	$\langle 23^+ \rangle$							88(12)				

(continued)

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	1096.43 $\langle 13^+ \rangle$	1101.32 $\langle 13^+ \rangle$	1105.28 $\langle 11^- \rangle$	1160.91 $\langle 19^- \rangle$	1163.94 $\langle 15^+ \rangle$	1194.74 $\langle 19^+ \rangle$	1223.06 $\langle 13^- \rangle$	1276.79 $\langle 15^+ \rangle$	1281.38 $\langle 15^+ \rangle$	1358.69 $\langle 15^- \rangle$
1678.84(5)	$\langle 19^+ \rangle$							26(8)		31(5)		
1691.19(4)	$\langle 19^- \rangle$											30(3)
1705.48(6)	$\langle 19^+ \rangle$										35(4)	
1901.18(9)	$\langle 21^+ \rangle$							[100]				
2098.02(6)	$\langle 23^- \rangle$	14(3)										

Energy levels and branching ratios [00Ba65]. Part 7

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	1372.67 $\langle 17^+ \rangle$	1378.15 $\langle 21^- \rangle$	1381.00 $\langle 19^- \rangle$	1424.58 $\langle 21^+ \rangle$	1429.49 $\langle 21^+ \rangle$	1470.19 $\langle 17^+ \rangle$	1487.31 $\langle 17^+ \rangle$	1524.87 $\langle 17^- \rangle$	1528.64 $\langle 25^- \rangle$	1549.97 $\langle 23^+ \rangle$
1562.85(5)	$\langle 19^+ \rangle$		21(5)									
1606.73(5)	$\langle 23^- \rangle$			x								
1668.84(4)	$\langle 23^+ \rangle$					12(4)						
1678.84(5)	$\langle 19^+ \rangle$							<54				
1705.48(6)	$\langle 19^+ \rangle$						<27		<65			
1808.63(4)	$\langle 23^- \rangle$				39(1)		<65				x	
1813.88(5)	$\langle 21^+ \rangle$	x					x					
1858.57(6)	$\langle 25^- \rangle$			<82								
1915.33(5)	$\langle 25^+ \rangle$					21(3)	60(5)				x	20(2)
1916.55(6)	$\langle 21^- \rangle$				x					x		
1922.37(6)	$\langle 25^+ \rangle$						[100]					
2022.19(9)	$\langle 23^+ \rangle$											100
2030.73(6)	$\langle 29^- \rangle$										100	
2065.53(15)	$\langle 27^+ \rangle$										x	x
2098.02(6)	$\langle 23^- \rangle$										<34	
2135.88(7)	$\langle 23^+ \rangle$					x						
2279.64(8)	$\langle 27^- \rangle$										52(7)	
2396.38(8)	$\langle 25^- \rangle$										7(2)	
2573.24(16)	$\langle 27^- \rangle$										x	

Energy levels and branching ratios [00Ba65]. Part 8

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage										
		E_f^* :	1562.85	1606.73	1668.84	1678.84	1691.19	1808.63	1813.88	1858.57	1901.18	1915.33
[keV]		$2J_f^\pi$:	$\langle 19^+ \rangle$	$\langle 23^- \rangle$	$\langle 23^+ \rangle$	$\langle 19^+ \rangle$	$\langle 19^- \rangle$	$\langle 23^- \rangle$	$\langle 21^+ \rangle$	$\langle 25^- \rangle$	$\langle 21^+ \rangle$	$\langle 25^+ \rangle$
1813.88(5)	$\langle 21^+ \rangle$	x										
1858.57(6)	$\langle 25^- \rangle$			100								
1901.18(9)	$\langle 21^+ \rangle$					<88						

(continued)

 $^{167}_{69}\text{Tm}$

E^*	$2J^\pi$	Branching ratios in percentage										
		E_f^* :	1562.85	1606.73	1668.84	1678.84	1691.19	1808.63	1813.88	1858.57	1901.18	1915.33
[keV]		$2J_f^\pi$:	$\langle 19^+ \rangle$	$\langle 23^- \rangle$	$\langle 23^+ \rangle$	$\langle 19^+ \rangle$	$\langle 19^- \rangle$	$\langle 23^- \rangle$	$\langle 21^+ \rangle$	$\langle 25^- \rangle$	$\langle 21^+ \rangle$	$\langle 25^+ \rangle$
2022.19(9)	$\langle 23^+ \rangle$	<82										
2098.02(6)	$\langle 23^- \rangle$						86(7)					
2113.72(8)	$\langle 27^- \rangle$									[100]		
2135.88(7)	$\langle 23^+ \rangle$					81(10)					19(5)	
2186.37(5)	$\langle 27^+ \rangle$				77(14)							
2279.64(8)	$\langle 27^- \rangle$							48(12)				
2321.02(7)	$\langle 25^+ \rangle$								68(4)			32(9)
2381.98(18)	$\langle 25^+ \rangle$										99(19)	
2394.35(6)	$\langle 29^- \rangle$									x		
2396.38(8)	$\langle 25^- \rangle$							8(2)				
2440.40(7)	$\langle 29^+ \rangle$											x

Energy levels and branching ratios [00Ba65]. Part 9

 $^{167}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage											
		E_f^* : $2J_f^\pi$:	1916.55 $\langle 21^- \rangle$	1922.37 $\langle 25^+ \rangle$	2030.73 $\langle 29^- \rangle$	2065.53 $\langle 27^+ \rangle$	2098.02 $\langle 23^- \rangle$	2113.72 $\langle 27^- \rangle$	2135.88 $\langle 23^+ \rangle$	2186.37 $\langle 27^+ \rangle$	2279.64 $\langle 27^- \rangle$	2394.35 $\langle 29^- \rangle$	2455.56 $\langle 29^+ \rangle$
2186.37(5)	$\langle 27^+ \rangle$			23(2)									
2381.98(18)	$\langle 25^+ \rangle$								0.54(18)				
2394.35(6)	$\langle 29^- \rangle$							x					
2396.38(8)	$\langle 25^- \rangle$		85(10)										
2440.40(7)	$\langle 29^+ \rangle$			x		x							
2455.56(9)	$\langle 29^+ \rangle$			50(6)						50(6)			
2573.24(16)	$\langle 27^- \rangle$				23(6)		77(12)						
2593.41(13)	$\langle 33^- \rangle$				100								
2620.20(13)	$\langle 31^+ \rangle$				50(7)	50(7)							
2670.48(9)	$\langle 31^- \rangle$							80(11)				20(6)	
2735.76(9)	$\langle 31^+ \rangle$									24(6)			76(3)
2799.01(22)	$\langle 31^- \rangle$			x							x		

Energy levels [94Sh13, 88Sh11].

 $^{168}_{69}\text{Tm}$

E^* [keV]	J^π	L	C^2S (d,t)	σ (τ ,d) $\mu\text{b/sr}$	σ (α ,t) $\mu\text{b/sr}$	σ (τ , α) $\mu\text{b/sr}$	σ (d,t) $\mu\text{b/sr}$	L	C^2S (d,t)	$T_{1/2}$ or Γ_{cm}	Ref.
0.0	3^+			11.8	9.2					93.1(2) d	73Ko06 73Pr06
3	$\langle 1 \rangle^-$	1	0.14				115	1	0.14		73Ko06 73Pr06
17											
41(1)	$\langle 2^- \rangle$	$\langle 3 \rangle$	0.04				14	$\langle 3 \rangle$	0.04		73Ko06 73Pr06

(continued)

¹⁶⁸Tm
69

E^*	J^π	L	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, t)$	$\sigma(\tau, \alpha)$	$\sigma(d, t)$	L	C^2S	$T_{1/2}$ or	Ref.
[keV]			(d, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(d, t)	Γ_{cm}	
≈ 47				≈ 1.2	≈ 1.0	≈ 2.3					
64(1)	$\langle 4 \rangle^+$	4	0.30	12.3	7.0		7.2	4	0.30		73Ko06 73Pr06
≈ 80				≈ 2.7	≈ 1.2						
112(1)	$\langle 3^- \rangle$	$\langle 3 \rangle$	0.04			1.4	9.8	$\langle 3 \rangle$	0.04		73Ko06 73Pr06
144(3)	$\langle 5 \rangle^+$	4	0.14			1.6		4	0.14		73Ko06 73Pr06
148(2)	$\langle 4^+ \rangle$			20	13.2		≈ 0.8				
167(2)	$\langle 0 \rangle^-$	1	0.084				57.8	1	0.084		73Ko06 73Pr06
178(2)	$\langle 4^- \rangle$	$\langle 3 \rangle$	0.07	2.7	≈ 4.1	2.8	21.4	$\langle 3 \rangle$	0.07		73Ko06 73Pr06
≈ 185											
200(2)	$\langle 3^-, 4^- \rangle$			28.5	11.6						73Pr06
204(2)				7.4							73Pr06
230(1)	$\langle 1 \rangle^-$	1	0.11				71.7	1	0.11		73Ko06 73Pr06
231(2)	$\langle 5^+ \rangle$			16.6	9						73Pr06
235(1)	$\langle 2^- \rangle$						17.7				73Pr06
243(1)	$\langle 6 \rangle^+$	6	1.25	10.9	10	40.7	5.6	6	1.25		73Ko06 73Pr06
245(2)	$\langle 5^- \rangle$			incl	incl						
312(2)	$\langle 6^-, 7^+ \rangle$			12.4	18.6						73Pr06
325(2)	$\langle 3^- \rangle$	$\langle 3 \rangle$	0.09				15.4	$\langle 3 \rangle$	0.09		73Ko06 73Pr06
328(3)	$\langle 6^+ \rangle$					6.3					73Pr06
336(3)	$\langle 4^- \rangle$			19.7	8.7						73Pr06
347(2)	$\langle 3 \rangle^-$	3	0.12				18.2	3	0.12		73Ko06 73Pr06
352(3)	$\langle 7^+ \rangle$					8.9	3.4				73Pr06
366(2)				1.3	0.7						73Pr06
383(2)	$\langle 4 \rangle^-$	3	0.11			3.5	16.7	3	0.11		73Ko06 73Pr06
390(2)	$\langle 7^- \rangle$			1.4	2.4						73Pr06
439							1.8				73Pr06
447(1)	$\langle 7 \rangle^+$	6	1.5	7.4	3.1	50.4	9.3	6	1.5		73Ko06 73Pr06
448(2)	$\langle 5^- \rangle$										
482						3.5					73Pr06
493(2)				2.1	2.0						73Pr06
≈ 499							1.8				73Pr06
520(2)				10.4	3.8						73Pr06
564(2)	$\langle 6^- \rangle$			4.8	2.9						73Pr06
580(2)				2.9							73Pr06
592(2)	$\langle 4 \rangle^-$	3	0.09			1.9	12.8	3	0.09		73Ko06 73Pr06
609(2)				6	3.7						73Pr06
614(2)	$\langle 1 \rangle^-$	1	0.029				17.2	1	0.029		73Ko06 73Pr06
631(2)				6.5	3.8						73Pr06
638(2)	$0^- - 2^-$	1	0.009				4.4	1	0.009		73Ko06 73Pr06
664(2)	$\langle 2 \rangle^-$	1	0.007				3.5	1	0.007		73Ko06 73Pr06
674(2)				2.5	1.3						73Pr06
698(2)	$\langle 7^- \rangle$			2.4	1.8						73Pr06
700(2)	$\langle 2^- \rangle$	1+3	0.05			2.2	27.7	1+3	0.05		73Ko06 73Pr06
708(1)							10.2				73Pr06
717						1.9	4.6				73Pr06

(continued)

 $^{168}_{69}\text{Tm}$

E^*	J^π	L	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, t)$	$\sigma(\tau, \alpha)$	$\sigma(d, t)$	L	C^2S	$T_{1/2}$ or	Ref.
[keV]			(d, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(d, t)	Γ_{cm}	
726(2)	$\langle 3^- \rangle$	3	0.12				9.7	3	0.12		73Ko06 73Pr06
732(2)	$\langle 6^+ \rangle$			35.6	15.4		5.6				73Pr06
744						1.5					73Pr06
760(2)				6.1	2.4						73Pr06
769(2)	$\langle 3^+-5^+ \rangle$	$\langle 4 \rangle$	0.62				5.8	$\langle 4 \rangle$	0.62		73Ko06 73Pr06
780(3)	$\langle 2^- \rangle$	$\langle 1+3 \rangle$	0.01			8.1	7.7	$\langle 1+3 \rangle$	0.01		73Ko06 73Pr06
792(2)	$0^- - 2^-$	1	0.057				12.8	1	0.057		73Ko06 73Pr06
794(1)							11.2				73Pr06
798(1)						3.7	9.8				73Pr06
818(3)	$\langle 1^+ \rangle$	$\langle 2 \rangle$	0.04	16.6	5.1			$\langle 2 \rangle$	0.04		73Ko06 73Pr06
836(4)	$0^- - 2^-$	1	0.009				3.9	1	0.009		73Ko06 73Pr06
847(2)	$\langle 2^+ \rangle$			14.6	4.4						73Pr06
849(2)	$\langle 3^- \rangle$	3	0.18			8.1	13.7	3	0.18		73Ko06 73Pr06
859(1)							6.3				73Pr06
866(1)							9.3				73Pr06
885(2)	$0^- - 2^-$	1	0.10			7.0	38.5	1	0.10		73Ko06 73Pr06
890(2)	$\langle 3^+ \rangle$			6.9	2.5		incl				73Pr06
897(1)							12.1				73Pr06
905(1)							24.7				73Pr06
915						21.8	3.7				73Pr06
921(1)						8.6	9.5				73Pr06
936(2)	$2^- - 4^-$	3	0.10	2.5	0.9		6.2	3	0.10		73Ko06 73Pr06
945							4.6				73Pr06
951(3)	$\langle 3^- \rangle$	3	0.081			30.4	7.4	3	0.081		73Ko06 73Pr06
966(3)	$\langle 4^- \rangle$	$\langle 3+5 \rangle$	0.05		1.2	incl	3.7	$\langle 3+5 \rangle$	0.05		73Ko06 73Pr06
974(3)						9.9					73Pr06
985(2)	$2^- - 4^-$	3	0.055				1.8	3	0.055		73Ko06 73Pr06
993(2)				2.3			2.7				73Pr06
1001(2)					2.7						73Pr06
1009(2)				2.3							73Pr06
1019(6)	$\langle 2^- - 4^- \rangle$	$\langle 3 \rangle$	0.03	4.8				$\langle 3 \rangle$	0.03		73Ko06 73Pr06
1039(2)	$2^- - 4^-$	3	0.17		[0.8]	9.8	10.9	3	0.17		73Ko06 73Pr06
1052	$\langle 4^- \rangle$	3	0.24				3	3	0.24		73Ko06 73Pr06
1056(2)	$\langle 0^+ \rangle$						16.7				73Pr06
1061(2)				6	3.8	24.2	2				73Pr06
1077(5)	$\langle 2^- - 4^- \rangle$	$\langle 3 \rangle$	0.07				4.4	$\langle 3 \rangle$	0.07		73Ko06 73Pr06
1098(2)	$\langle 5^- \rangle$	$\langle 5 \rangle$	1.6			25.8	7.9	$\langle 5 \rangle$	1.6		73Pr06
1115(2)	$\langle 2^+ \rangle$	2	0.58				44.3	2	0.58		73Ko06 73Pr06
1127(2)	$\langle 1^+ \rangle$	0	0.27				42.7	0	0.27		73Ko06 73Pr06
1133(1)	$\langle 2^+ \rangle$					19.1	14.2				73Pr06
1162(2)	$\langle 5^- \rangle$	$\langle 5 \rangle$	0.54					$\langle 5 \rangle$	0.54		73Ko06 73Pr06
1170(3)						6.8					73Pr06
1182(2)	$\langle 3^+ \rangle$	$\langle 2 \rangle$	0.10				7.5	$\langle 2 \rangle$	0.10		73Ko06 73Pr06
1187						2.8					73Pr06
1194(2)	$\langle 1^+ - 3^+ \rangle$	$\langle 2 \rangle$	0.05				3	$\langle 2 \rangle$	0.05		73Ko06 73Pr06

(continued)

¹⁶⁸Tm
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E^*	J^π	L	C^2S	σ (τ, d)	σ (α, t)	σ (τ, α)	σ (d, t)	L	C^2S	$T_{1/2}$ or	Ref.
[keV]			(d, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(d, t)	Γ_{cm}	
≈ 1202				≈ 2.4							73Pr06
≈ 1225				≈ 3							73Pr06
1240(2)	$\langle 3 \rangle^+$	2	0.23				7.9	2	0.23		73Ko06 73Pr06
1243							9.3				73Pr06
1260(2)	$1^+ - 3^+$	2	0.35	≈ 2.8		3.6	15.6	2	0.35		73Ko06 73Pr06
1268(1)							6.5				73Pr06
1276(2)	$1^+ - 3^+$	2	0.22	≈ 2.7			9.1	2	0.22		73Ko06 73Pr06
1281(1)							5.1				73Pr06
1302(2)	$\langle 1^+ - 3^+ \rangle$	$\langle 2 \rangle$	0.09				4.2	$\langle 2 \rangle$	0.09		73Ko06 73Pr06
1311(2)	$0^+, 1^+$	0	0.048				6.3	0	0.048		73Ko06 73Pr06
1322(2)				7.6	1.1						73Pr06
1330(2)	$\langle 2^- - 4^- \rangle$	$\langle 3 \rangle$	0.15				5.7	$\langle 3 \rangle$	0.15		73Ko06 73Pr06
1343(2)				≈ 3.0	1.0	1.6					73Pr06
1347(2)	$\langle 1 \rangle^+$	0	0.28				27.2	0	0.28		73Ko06 73Pr06
1356(1)							5.5				
1362(2)	$\langle 1^+ - 3^+ \rangle$	$\langle 2 \rangle$	0.09				2.8	$\langle 2 \rangle$	0.09		73Ko06 73Pr06
1378(3)	$\langle 2^+ \rangle$	$\langle 2 \rangle$	0.08				4.9	$\langle 2 \rangle$	0.08		73Ko06 73Pr06
1389(2)	$\langle 4^- \rangle$			40.6	2.5						73Pr06
1390(6)	$\langle 0^- - 2^- \rangle$	$\langle 1 \rangle$	0.016					$\langle 1 \rangle$	0.016		73Ko06 73Pr06
1407(4)	$0^+, 1^+$	0	0.035					0	0.035		73Ko06 73Pr06
1414(2)				23.8	1.2	2.9					73Pr06
1426(2)	$\langle 1 \rangle^+$	0	0.27				22.8	0	0.27		73Ko06 73Pr06
1434(2)	$\langle 3^- \rangle$			27.6	2	7.8	4.1				73Pr06
1445(2)	$0^+, 1^+$	0	0.051				4.1	0	0.051		73Ko06 73Pr06
1454						3.1					73Pr06
≈ 1460				≈ 8.0	1.9						73Pr06
1465(2)	$0^+, 1^+$	0	0.28				17.7	0	0.28		73Ko06 73Pr06
1472(1)							8.1				73Pr06
1482(2)	$\langle 5^- \rangle$			26.8	1.7						73Pr06
1484(5)	$\langle 2^+ \rangle$	$\langle 2 \rangle$	0.05					$\langle 2 \rangle$	0.05		73Ko06 73Pr06
1501(2)				≈ 8.0	0.9						73Pr06
1506(2)	$0^+, 1^+$	0	0.068				5.3	0	0.068		73Ko06 73Pr06
1520							2.3				73Pr06
1540(2)	$\langle 4^- \rangle$			≈ 5.8	0.7						73Pr06
1554							0.9				73Pr06
1563(2)				≈ 2.0	1.1	2.4					73Pr06
1568							2.1				73Pr06
1590(2)	$\langle 6^- \rangle$			10.4	1.0						73Pr06
1604							1.8				73Pr06
1617						3.1					73Pr06
1621							1.8				73Pr06
1628(2)	$\langle 5^- \rangle$			4.8							73Pr06
1637							2.8				73Pr06
1662(1)							7.6				73Pr06
1690							3.2				73Pr06

(continued)

¹⁶⁸Tm

E^*	J^π	L	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, t)$	$\sigma(\tau, \alpha)$	$\sigma(d, t)$	L	C^2S	$T_{1/2}$ or	Ref.
[keV]			(d, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(d, t)	Γ_{cm}	
1693						1.0					73Pr06
1742							1.6				73Pr06
1802						3.4					73Pr06
1905						2.8					73Pr06
				73Pr06	73Pr06	73Pr06	73Pr06		73Ko06		Ref.

Additional data on this isotope can be found in [95Si20, 71Jo18].

 $C^2S = d\sigma/d\Omega_{\text{exp}}/N \times d\sigma/d\Omega_{\text{theory}}$ with $N=3.33$ [88Sh11].

Energy levels and branching ratios [91Sh18].

¹⁶⁹Tm

E^*	$2J^\pi$	$\Gamma_{\gamma o}$	L	$\sigma(\tau, d)$	S_N	$\sigma(\alpha, t)$	S_N	$T_{1/2}$ or	Ref.
[keV]		[meV]	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(α, t)	Γ_{cm}	
0.0	1 ⁺			45.7		51.1		Stable	74Ch44
8.4103(3)	3 ⁺			incl	$\langle 0.64 \rangle$	incl	$\langle 0.91 \rangle$	4.08(8) ns	74Ch44
118.1902(3)	5 ⁺			27.9	0.32	20.6	0.39	62(3) ps	74Ch44
138.9341(4)	7 ⁺			incl	0.28	7.8	0.19	302(2) ps	74Ch44
316.1482(4)	7 ⁺			19.6	1.19	43.3	1.67	660(3) ns	00Ko61
332.119(10)	9 ⁺							18.8(5) ps	00Ko61
341.94(4)	$\langle 1^- \rangle$			52.1		26.1			00Ko61
345.031(4)	$\langle 5^- \rangle$			incl		incl			00Ko61
367.67(4)	11 ⁺							41.6(21) ps	00Ko61
379.2690(5)	7 ⁻							52.6(9) ns	
430.125(11)	$\langle 9^- \rangle$			10.7	1.03	49.5			74Ch44
433.523(18)	$\langle 9^+ \rangle$								
472.8841(5)	9 ⁻							0.14(7) ns	
474.973(6)	3 ⁻		1	30.8	0.13	4.5			74Ch44
570.829(11)	3 ⁺			12.9	0.04	0.9		10(7) ps	74Ch44
575.38(4)	$\langle 11^+ \rangle$			incl		26.1			74Ch44
588.20(5)	$\langle 11^- \rangle$				0.57				74Ch44
602.9(2)	$\langle 13^- \rangle$								
633.296(3)	5 ⁺			33.2	0.39	12.5			74Ch44
637.0(2)	13 ⁺							5.4(4) ps	
646.762(10)	$\langle 7^- \rangle$			13.6	0.09	9.6			74Ch44
691.2(2)	15 ⁺							8.1(4) ps	
718.791(4)	$\langle 7^+ \rangle$								00Ko61
725.45(7)	$\langle 13^- \rangle$								
741.25(5)	$\langle 13^+ \rangle$								
781.804(4)	5 ⁺		2	102.2	0.87	44.1	1.34		74Ch44
832.41(5)	$\langle 9^+ \rangle$								00Ko61
865.9(4)	$\langle 17^- \rangle$								
878.35(9)	$\langle 7^+ \rangle$								00Ko61

(continued)

 ^{169}Tm

E^*	$2J^\pi$	Γ_{γ_0}	L	σ (τ, d)	S_N	σ (α, t)	S_N	$T_{1/2}$ or	Ref.
[keV]		[meV]	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(α, t)	Γ_{cm}	
883.8(2)	$\langle 15^- \rangle$								
884.6(2)	$\langle 11^- \rangle$			6.4		4.3			74Ch44
≈ 900									
929.8(2)	$\langle 15^+ \rangle$								
938(2)				16.4		9.9			74Ch44
964.0(4)	$\langle 11^+ \rangle$								
1027.8(2)	17^+							1.91(18) ps	
1040.0(2)									
1058.5(2)				20.1	1.13	32.4			74Ch44
1063.6(2)	$\langle 17^- \rangle$								
1104.1(3)	19^+							1.9(2) ps	
1112.6(5)									
1135.9(2)									
1140.7(2)	$\langle 17^+ \rangle$								
1152(2)	$\langle 11^- \rangle$								
1188.9(2)	$\langle 15^- \rangle$								
1190(20)									
1218.1(4)	$\langle 21^- \rangle$								
1223.0(2)									
1243(2)				10.9		3.8			74Ch44
1262.4(2)	$\langle 19^- \rangle$								
1300.8(5)	$\langle 15^+ \rangle$								
1372(2)	1^+		0	32.0		1.4			74Ch44
1372.5(5)	$\langle 19^+ \rangle$								
1400(2)				56.3		3.2			74Ch44
1483.0(2)	$\langle 21^- \rangle$								
1497.8(4)	21^+							0.87(9) ps	
1510.6(4)		1.6(4)							99Hu01
1515(2)				41.1		10.0			74Ch44
1527.5(6)		1.0(4)							99Hu01
1548.4(6)	$\langle 19^- \rangle$								
1598.3(3)	$\langle 23^+ \rangle$								
1625.1(5)	$\langle 21^+ \rangle$								
1658.1(5)	$\langle 25^- \rangle$								
1716.8(3)	$\langle 23^- \rangle$								
1864.6(2)		4.0(6)							99Hu01
1910.5(1)		12.6(7)							99Hu01
1922.3(2)		0.8(2)							99Hu01
1963.7(3)		0.4(1)							99Hu01
1978.4(3)		0.4(1)							99Hu01
1991.7(2)		1.3(3)							99Hu01
2075.5(7)		0.8(4)							99Hu01
2168.7(4)		0.7(2)							99Hu01
2190.6(3)		0.5(1)							99Hu01
2215.3(3)		0.4(2)							99Hu01

(continued)

 $^{169}_{69}\text{Tm}$

E^*	$2J^\pi$	$\Gamma_{\gamma o}$	L	σ (τ, d)	S_N	σ (α, t)	S_N	$T_{1/2}$ or	Ref.
[keV]		[meV]	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(α, t)	Γ_{cm}	
2236.1(2)		1.0(1)							99Hu01
2262.5(4)		0.9(2)							99Hu01
2293.8(4)		0.4(1)							99Hu01
2306.3(5)		0.3(1)							99Hu01
2312.2(4)		0.7(2)							99Hu01
2386.6(4)		0.4(2)							99Hu01
2455.8(4)		0.5(1)							99Hu01
2466.0(2)		0.2(1)							99Hu01
2492.0(2)		1.0(1)							99Hu01
2553.4(12)		0.5(2)							99Hu01
2571.4(6)		0.2(1)							99Hu01
2598.6(8)		0.7(2)							99Hu01
2602.8(11)		0.4(1)							99Hu01
2687.0(4)		0.2(1)							99Hu01
2749.4(5)		0.6(2)							99Hu01
2756.4(7)		0.3(1)							99Hu01
2769.1(4)		0.9(1)							99Hu01
2786.5(4)		0.4(1)							99Hu01
2814.2(6)		0.7(4)							99Hu01
2818.6(4)		0.3(1)							99Hu01
2843.1(5)		0.22(6)							99Hu01
2861.1(7)		0.7(2)							99Hu01
2943.3(4)		0.9(3)							99Hu01
2996.2(4)		0.7(1)							99Hu01
3127.6(6)		0.4(1)							99Hu01
3175.6(7)		0.21(6)							99Hu01
3185.0(12)		0.6(3)							99Hu01
3187.5(7)		0.2(1)							99Hu01
3191.3(5)		0.6(1)							99Hu01
3199.7(7)		0.7(2)							99Hu01
3204.8(7)		0.9(2)							99Hu01
3254.6(4)		0.5(2)							99Hu01
3274.5(8)		0.6(1)							99Hu01
3286.5(3)		0.6(1)							99Hu01
3299.6(6)		0.8(3)							99Hu01
3308.4(9)		0.3(1)							99Hu01
3341.2(7)		0.8(2)							99Hu01
3376.4(4)		0.6(1)							99Hu01
3383.9(6)		0.4(1)							99Hu01
3419.2(5)		0.4(1)							99Hu01
3436.3(8)		0.6(2)							99Hu01
3442.0(10)		0.2(1)							99Hu01
3458.6(7)		0.3(2)							99Hu01
3475.7(3)		1.1(3)							99Hu01
3480.3(3)		0.4(1)							99Hu01

(continued)

 $^{169}_{69}\text{Tm}$

E^*	$2J^\pi$	Γ_{γ_0}	L	$\sigma(\tau, d)$	S_N	$\sigma(\alpha, t)$	S_N	$T_{1/2}$ or	Ref.
[keV]		[meV]	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(α, t)	Γ_{cm}	
3497.0(4)		0.17(7)							99Hu01
3527.0(7)		0.4(1)							99Hu01
3538.7(6)		0.22(6)							99Hu01
3541.9(6)		0.5(2)							99Hu01
3573.3(4)		0.3(2)							99Hu01
3613.0(3)		0.3(1)							99Hu01
3624.8(3)		1.2(2)							99Hu01
3724.7(5)		0.7(1)							99Hu01
3736.2(7)		0.21(8)							99Hu01
3741.7(4)		0.3(1)							99Hu01
3766.3(7)		0.25(7)							99Hu01
3795.7(11)		0.3(2)							99Hu01
3806.7(6)		0.16(6)							99Hu01
3862.5(6)		0.24(8)							99Hu01
3875.3(7)		0.3(1)							99Hu01
3916.8(6)		0.3(1)							99Hu01
3950.2(7)		0.31(6)							99Hu01
4103.6(5)		0.12(5)							99Hu01
4190.2(10)		0.4(3)							99Hu01
4379.7(4)		0.17(6)							99Hu01
4764.5(14)		0.12(7)							99Hu01
4789.8(11)		0.17(8)							99Hu01
4853.0(11)		0.14(8)							99Hu01
4865.5(8)		0.3(2)							99Hu01
4954.0(5)		0.5(1)							99Hu01
5211.5(6)		0.6(1)							99Hu01
5507.4(27)		0.47(55)							99Hu01
5529.9(6)		1.2(4)							99Hu01
5593.3(11)		1.1(8)							99Hu01
5598.3(4)		0.7(4)							99Hu01
15760(130)									
16102									
16340(140)									
		99Hu01		74Ch44	74Ch44	74Ch44	74Ch44		Ref.

Additional data on this isotope can be found in [00Ko61, 99Hu01, 93Li15].

Abundance: 100 %. $S_N = d\sigma/d\Omega_{\text{exp}}/N \times d\sigma/d\Omega_{\text{theory}}$ with $N=4.42$ [91Sh18]. $\sigma(\tau, d)$ and $\sigma(\alpha, t)$ were measured at 30° and 45° , respectively; see data for 60° in [74Ch44].

Data for this isotope are considered in vol. LB I/18C.

Energy levels and branching ratios [91Sh18]. Part 2

 $^{169}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage					
		$E_f^*:$ $2J_f^\pi:$	0.0 1^+	8.4 3^+	118 5^+	139 7^+	316 7^+
8.4103(3)	3^+		100				
118.1902(3)	5^+		9.67(9)	90(1)			
138.9341(4)	7^+			98.3(8)	1.65(13)		
316.1482(4)	7^+			14.78(11)	52.6(4)	32.6(3)	
332.119(10)	9^+				32.9(5)	67.1(11)	
341.94(4)	$\langle 1^- \rangle$		35(18)	65(32)			
345.031(4)	$\langle 5^- \rangle$			67.7(11)	1.9(14)	30.4(3)	
367.67(4)	11^+					x	x
379.2690(5)	7^-		0.0027(4)	0.0156(13)	3.73(3)	0.247(3)	96.0(13)
430.125(11)	$\langle 9^- \rangle$					[100]	
433.523(18)	$\langle 9^+ \rangle$					2.3(6)	98(5)
472.8841(5)	9^-					0.069(6)	0.381(12)
474.973(6)	3^-		[55(1)]	[5(1)]	[40(2)]		
570.829(11)	3^+		[48(4)]	[45(1)]	[6(1)]		
575.38(4)	$\langle 11^+ \rangle$						49(24)
633.296(3)	5^+		0.07	47(2)	39.3(6)	14.1(2)	
646.762(10)	$\langle 7^- \rangle$				70(7)	0.59(31)	
718.791(4)	$\langle 7^+ \rangle$			[0.9]	[33]	[56]	
781.804(4)	5^+		0.36(3)	25.0(4)	23(1)	9.2(2)	22.9(3)
832.41(5)	$\langle 9^+ \rangle$					41(2)	
878.35(9)	$\langle 7^+ \rangle$				20(5)	44(6)	
≈ 900			100				
1190(20)			100				

Energy levels and branching ratios [91Sh18]. Part 3

 $^{169}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	332.119 9^+	341.94 $\langle 1^- \rangle$	345.031 $\langle 5^- \rangle$	367.67 11^+	379.269 7^-	430.125 $\langle 9^- \rangle$	433.523 $\langle 9^+ \rangle$	472.884 9^-	474.973 3^-	570.829 3^+
433.523(18)	$\langle 9^+ \rangle$		<18			<25						
472.8841(5)	9^-					0.10(3)	99.5(14)	<10				
575.38(4)	$\langle 11^+ \rangle$								51(5)			
588.20(5)	$\langle 11^- \rangle$						9(5)			91(9)		
602.9(2)	$\langle 13^- \rangle$					86(9)		14(7)				
637.0(2)	13^+		51.6(10)			48.4(8)						
646.762(10)	$\langle 7^- \rangle$		15		3.9			3.5			7(3)	
691.2(2)	15^+					100						
718.791(4)	$\langle 7^+ \rangle$		[10]									
725.45(7)	$\langle 13^- \rangle$									22(2)		
741.25(5)	$\langle 13^+ \rangle$								<31			
781.804(4)	5^+											13
832.41(5)	$\langle 9^+ \rangle$		42(4)			16(10)						

(continued)

 $^{169}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	332.119 9 ⁺	341.94 1 ⁻	345.031 5 ⁻	367.67 11 ⁺	379.269 7 ⁻	430.125 9 ⁻	433.523 9 ⁺	472.884 9 ⁻	474.973 3 ⁻	570.829 3 ⁺
878.35(9)	7 ⁺		36(10)									
884.6(2)	11 ⁻		64					13				
964.0(4)	11 ⁺		42			58						
1040.0(2)					73						27	
1058.5(2)				100								
1112.6(5)								100				
1135.9(2)					100							
1223.0(2)				43	57							

Energy levels and branching ratios [91Sh18]. Part 4

 $^{169}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage											
		E_f^* : $2J_f^\pi$:	575.38 11 ⁺	588.20 11 ⁻	602.9 13 ⁻	633.296 5 ⁺	637.0 13 ⁺	646.762 7 ⁻	691.2 15 ⁺	718.791 7 ⁺	725.45 13 ⁻	741.25 13 ⁺	781.804 5 ⁺
725.45(7)	13 ⁻			78(8)									
741.25(5)	13 ⁺		100										
781.804(4)	5 ⁺					7							
865.9(4)	17 ⁻				71(11)				29(16)				
883.8(2)	15 ⁻			<71							100		
884.6(2)	11 ⁻				23								
929.8(2)	15 ⁺		73(7)									27(14)	
1027.8(2)	17 ⁺						66(2)		34(3)				
1063.6(2)	17 ⁻										53(5)		
1104.1(3)	19 ⁺								100				
1140.7(2)	17 ⁺											100	
1188.9(2)	15 ⁻				[100]								
1300.8(5)	15 ⁺								100				

Energy levels and branching ratios [91Sh18]. Part 5

 $^{169}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage											
		E_f^* : $2J_f^\pi$:	832.41 9 ⁺	865.9 17 ⁻	883.8 15 ⁻	929.8 15 ⁺	1027.8 17 ⁺	1063.6 17 ⁻	1104.1 19 ⁺	1140.7 17 ⁺	1218.1 21 ⁻	1262.4 19 ⁻	1483.0 21 ⁻
1063.6(2)	17 ⁻				47(5)								
1140.7(2)	17 ⁺					<26							
1218.1(4)	21 ⁻			100									
1262.4(2)	19 ⁻				100								
1372.5(5)	19 ⁺					100							
1483.0(2)	21 ⁻							44(5)				56(6)	

(continued)

 ^{169}Tm

E^*	$2J^\pi$	Branching ratios in percentage											
[keV]		E_f^* : $2J_f^\pi$:	832.41 $\langle 9^+ \rangle$	865.9 $\langle 17^- \rangle$	883.8 $\langle 15^- \rangle$	929.8 $\langle 15^+ \rangle$	1027.8 17^+	1063.6 $\langle 17^- \rangle$	1104.1 19^+	1140.7 $\langle 17^+ \rangle$	1218.1 $\langle 21^- \rangle$	1262.4 $\langle 19^- \rangle$	1483.0 $\langle 21^- \rangle$
1497.8(4)	21^+						67(33)		33(17)				
1548.4(6)	$\langle 19^- \rangle$			100									
1598.3(3)	$\langle 23^+ \rangle$								100				
1625.1(5)	$\langle 21^+ \rangle$									100			
1658.1(5)	$\langle 25^- \rangle$										100		
1716.8(3)	$\langle 23^- \rangle$											x	x

Energy levels and branching ratios [02Ba93].

 ^{170}Tm

E^* [keV]	J^π	L (d,p)	σ (d,p) $\mu\text{b/sr}$	L (t, α)	K	σ (t, α) $\mu\text{b/sr}$	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage				
									E_f^* : J_f^π :	0.0 1^-	38.7 $\langle 2 \rangle^-$	114.5 $\langle 3 \rangle^-$	149.7 $\langle 0 \rangle^-$
0.0	1^-	1	112(3)		1	6.9	128.6(3) d	96Ho12					
38.7139(5)	$\langle 2 \rangle^-$	1	17(2)		1	44.2	1.7(2) ns	81De29	100				
114.544(1)	$\langle 3 \rangle^-$	3	30(2)		1	4.6	0.60(3) ns	96Ho12	83.2(3)	17(1)			
149.718(1)	$\langle 0 \rangle^-$	1	71(3)		0	2.2		96Ho12	95(8)	5.2(2)			
183.190(1)	$\langle 4 \rangle^-$	3	27(2)		1	5.1		96Ho12		99(12)	0.9(4)		
183.197(4)	$\langle 3 \rangle^+$						4.1(1) μs			71(4)	29.4(14)		
204.449(1)	$\langle 2 \rangle^-$		14(1)		2		<1 ns	96Ho12	69.2(4)	30(2)	0.59(6)		
219.706(1)	$\langle 2 \rangle^-$		30(2)		0	32.9	0.25(3) ns	96Ho12	36.8(3)	48(4)	13.6(1)	2.0(3)	
237.240(1)	$\langle 1 \rangle^-$	1	84(4)	2	0	20.4		96Ho12	69(1)	9.5(3)			22(1)
247.147(6)	$\langle 4 \rangle^+$		9.4(20)					96Ho12					
270.547(1)	$\langle 3 \rangle^-$		219(13)		2	1.3		96Ho12		44(3)	12.9(10)		
319.326(1)	$\langle 5 \rangle^-$		3.9(8)		1	4.4		96Ho12			100		
327.1(7)	$\langle 5^+ \rangle$					5.0		81De29					
349.733(1)	$\langle 3 \rangle^-$		55.3(20)		0	12.3		96Ho12		50(2)	23.5(6)		
355.047(6)	$\langle 4 \rangle^+$												
358.116(1)	$\langle 4 \rangle^-$		45.0(23)					96Ho12			9.4(13)		
381.426(1)	$\langle 4 \rangle^-$		43.6(21)		0	2.4		96Ho12		19.4(9)	24(2)		
402.728(2)	$\langle 3,4 \rangle^-$									13(1)	87(7)		
409.4(8)	$\langle 6^- \rangle$		4.0(10)					96Ho12					
419.2(5)			8.0(13)			≈ 2		96Ho12					
426.5(3)	$\langle 6^+ \rangle$		17.0(15)					96Ho12					
439.8(4)	$\langle 5^+ \rangle$		19.8(17)					96Ho12					
447.071(1)	$\langle 3 \rangle^-$		29.5(19)		3	≈ 3		96Ho12		10.0(1)	2.45(7)		
456.8(8)			7.8(11)					96Ho12					
467.8607(12)	$\langle 5 \rangle^-$		12.3(13)					96Ho12					
476.9(5)			2.6(7)					96Ho12					
539.7223(17)	$\langle 4 \rangle^-$		270(6)					96Ho12					
544.050(8)	$\langle 3^+ \rangle$								36(2)	64(4)			
550.7473(17)	$\langle 5 \rangle^-$		13.9(13)		0	≈ 3		96Ho12					
590.2286(17)	$\langle 1 \rangle^-$								44(1)	35.0(5)	x		1.7(1)

(continued)

 $^{170}\text{Tm}_{69}$

E^*	J^π	L	σ (d,p)	L	K	σ (t, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(d,p)	$\mu\text{b/sr}$	(t, α)		$\mu\text{b/sr}$	Γ_{cm}		E^*_f : J^π_f :	0.0 1 ⁻	38.7 (2) ⁻	114.5 (3) ⁻	149.7 (0) ⁻
594.2(4)										x			x
598.8(8)	$\langle 6^- \rangle$												
603.9897(14)	$\langle 1 \rangle^+$					3.8		81De29		37.7(7)	50.0(8)		7.3(2)
607.8862(16)	$\langle 3 \rangle^+$					incl		81De29			58(2)	4.0(2)	
616.6(4)	$\langle 7^- \rangle$		10.8(14)			4.2		96Ho12					
626.8(8)			8.8(13)					96Ho12					
637.9062(21)	$\langle 2 \rangle^-$									64.2(11)	6.0(3)	20.0(4)	
644(5)	$\langle 4^- \rangle$				4	19.1		81De29					
648.7467(14)	$\langle 1 \rangle^-$		27(4)					96Ho12		10.7(2)	4.8(2)	x	9.9(1)
650.3735(14)	$\langle 2 \rangle^+$									43.9(4)	17.3(6)	35.0(6)	
655.598(20)	$\langle 5^- \rangle$											100	
661.8564(12)	$\langle 1 \rangle^+$										8.3(2)		57(1)
677.6(6)			7.4(3)					96Ho12					
683.569(3)	$\langle 0 \rangle^-$												
687(5)						29.0		81De29					
693.2864(13)	$\langle 2 \rangle^-$		9.6(14)					96Ho12		22(2)			
703.6284(13)	$\langle 2 \rangle^+$									45(1)	14.1(3)	27.8(4)	
708.370(4)	$\langle 3 \rangle^-$									x	81.5(7)	2.9(2)	
709.474(4)	$\langle 1,2,3 \rangle^-$										16(8)		
715.6207(18)	$\langle 3 \rangle^-$			2	2	10.7		81De29					
719.2627(23)	$\langle 1 \rangle^+$									48.4(12)	18.1(5)		13.2(3)
733.8128(21)	$\langle 2 \rangle^-$									1.73(9)			
742.4(9)	$\langle \leq 2^+ \rangle$												
743.6(23)	$1^-, 2^-, 3^-$			2	1	78.5		81De29					
749.8482(16)	$\langle 3 \rangle^-$		19.2(14)					96Ho12			31(2)		
756.215(6)	$\langle 4 \rangle^-$												
758.3294(17)	$\langle 2 \rangle^+$												
760.4(8)												45(18)	55(18)
774(4)	$\langle 3 \rangle^-$			4	3	12.8		81De29					
775.2299(14)	$\langle 0 \rangle^+$												
782.1520(22)	$\langle 1 \rangle^-$												45.9(9)
790.1(8)	$\langle 6^- \rangle$		7.3(10)					96Ho12					
801(6)	$\langle 4^- \rangle$				1	2.2		81De29					
806.4274(24)	$\langle 4 \rangle^-$		2.7(7)					96Ho12					
818.5072(15)	$\langle 2 \rangle^+$									15.2(2)	3.0(2)	46(1)	
822.3935(15)	$\langle 2 \rangle^+$											29.0(3)	
829(7)	$\langle 5^+ \rangle$				4	17.8		81De29					
832.6(5)													
835.4(9)	$\langle 4^- \rangle$		2.1(8)					96Ho12					
839.131(4)	$\langle 3 \rangle^-$										<8.6	78.3(16)	
841.3(8)	$\langle \leq 2^+ \rangle$												
850.2(19)												14(4)	20(6)
854.335(4)	$\langle 2 \rangle^-$		8.2(13)	2	2	53.4		96Ho12		58.5(9)	33.6(2)	6.80(12)	
860.484(3)	$\langle 1 \rangle^+$											x	49.7(10)
862.7765(21)	$\langle 3 \rangle^-$		23.4(17)					96Ho12			52.6(8)	10.7(3)	

(continued)

 $^{170}_{69}\text{Tm}$

E^*	J^π	L	σ (d,p)	L	K	σ (t, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage			
[keV]		(d,p)	$\mu\text{b/sr}$	(t, α)		$\mu\text{b/sr}$	Γ_{cm}		E^*_f : 0.0	38.7	114.5	149.7
									J^π_f : 1 ⁻	$\langle 2 \rangle^-$	$\langle 3 \rangle^-$	$\langle 0 \rangle^-$
863.364(5)	$\langle 1 \rangle^-$											
867(6)	$\langle 3 \rangle^-$				3	≈ 40		81De29				
868.0(8)									29(14)			
891(4)	$\langle 5 \rangle^+$			5	3	41.4		81De29				
908.448(3)	$\langle 2 \rangle^-$		44.7(21)					96Ho12		4(1)	x	
921(2)	$\langle 5 \rangle^-$			2	2	70.9		81De29				
925.2722(22)	$\langle 3 \rangle^-$		10.5(11)					96Ho12		20.9(4)	21.3(3)	
948(4)	$\langle 6 \rangle^+$			5	4	60.3		81De29				
955.8(13)	$\langle 7 \rangle^-$		2.8(7)					96Ho12				
959.218(8)	$\langle 3 \rangle^-$								56.0(8)	17.0(7)	27.1(5)	
964.474(7)	$\langle 3,4 \rangle^-$											
964.8(10)						15.8		81De29				65(17)
979.929(4)	$\langle 3 \rangle^-$		29.6(17)					96Ho12			x	
984.981(7)	$\langle 3-5 \rangle^-$											
1011(1)	$\langle 6 \rangle^+$			5	3	22.4		81De29				
1014.0(10)	$\langle 4 \rangle^-$		2.1(7)					96Ho12				
1017.5(8)	$\langle \leq 2 \rangle^+$											
1025.0(10)			2.9(8)					96Ho12				
1046.5(9)			6.1(10)					96Ho12				
1057.3(9)												
1061(9)	$\langle 6 \rangle^-$					6.5		81De29				
1064.4579(14)	$\langle 1 \rangle^+$		13.5(13)					96Ho12				9(2)
1070.975(6)	$\langle 2 \rangle^-$								30.7(9)			
1072.7(4)											7(3)	
1078.8484(15)	$\langle 1 \rangle^+$					6.0		81De29		58.6(14)		
1087.8(10)												
1091.583(3)	$\langle 1,2 \rangle$								55.9(13)			26(3)
1101.999(4)	$\langle 2^+ \rangle$								19.2(7)		46.0(7)	
1111.1(4)			18.4(17)			2.8		96Ho12				
1131.1(8)	$\langle 5 \rangle^-$		13.5(18)					96Ho12				
1139.951(4)	$\langle 2 \rangle^-$		124(4)					96Ho12				
1141.9(5)									15(8)		85(15)	
1147.974(4)	$\langle 1,2 \rangle^-$		61(3)					96Ho12				20.8(3)
1160.597(3)	$\langle 1 \rangle^-$		60(3)					96Ho12				
1168.779(5)	$\langle 2 \rangle^-$											
1178.910(3)	$\langle 2 \rangle^-$		11.0(13)					96Ho12	38(1)	20.2(6)	10(2)	
1182.3(15)												
1192.828(10)	$\langle 2 \rangle^-$		6.2(12)			2.8		96Ho12	4(2)	16(1)		33(1)
1200.7(15)												
1210.679(11)	$\langle 2^+ \rangle$								68.6(11)	24.1(10)	x	
1213.1(8)	$\langle 3 \rangle^-$		13.4(22)	2	3	8.4		96Ho12				
1219.8(4)			32.8(26)					96Ho12				
1224.0(3)	$\langle \leq 2 \rangle^-$											
1230(5)	$\langle 7 \rangle^-$					6.0		81De29				
1232.4(4)*								96Va23	38(12)	62(12)		

(continued)

 $^{170}_{69}\text{Tm}$

E^*	J^π	L	σ (d,p)	L	K	σ (t, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(d,p)	$\mu\text{b/sr}$	(t, α)		$\mu\text{b/sr}$	Γ_{cm}		E_{f}^* : J_{f}^π :	0.0 1 ⁻	38.7 $\langle 2 \rangle^-$	114.5 $\langle 3 \rangle^-$	149.7 $\langle 0 \rangle^-$
1238.144(10)	$\langle 1,2 \rangle^-$									15(2)			
1245.1(4)			47.8(28)					96Ho12					
1258.2(4)			23.4(19)					96Ho12					
1265.07(1)	$\langle 0,1,2 \rangle^-$							96Va23		17(2)	23.3(8)		
1269.2(4)			47.8(26)					96Ho12					
1279.5(3)	$\langle \leq 2^- \rangle$		11.6(17)					96Ho12					x
1291(6)	$\langle 4^- \rangle$				3	15.7		81De29					
1295.3(4)			24.9(19)					96Ho12					
1299.107(13)	$\langle 2 \rangle^-$							96Va23	x			36(3)	
1309.3(17)													
1315.9(13)	$\langle 1 \rangle^-$			2	1	10.5		81De29	8				33(8)
1324.2(3)	$\langle \leq 2^- \rangle$												
1334.9(5)								96Va23	33			67(33)	
1354.6(2)	$\langle 2 \rangle^-$			2	1	12.0		81De29	35				35(9)
1363.5(5)*								96Va23		3(2)			34(5)
1375.1(2)	$\langle 1^- \rangle$												69(15)
1382.2(9)*	$\langle 2 \rangle^-$			2	2	14.2		81De29		22(11)			
1395.0(2)	$\langle \leq 2^- \rangle$							96Va23	11(4)	11(4)		19(7)	
1413.1(19)												28(11)	
1433.2(3)													
1437.2(11)													
1442.0(4)													
1443.1(4)*	$\langle 1^- \rangle$							96Va23		3(2)			10(3)
1448(1)	$\langle 3 \rangle^-$			4	2	15.0		81De29					
1453.1(6)	$\langle \leq 2 \rangle$												
1460.5(5)													
1466.3(2)	$\langle \leq 2^- \rangle$												47(5)
1472(3)	$\langle 1^- \rangle$												
1478.0(10)													36(18)
1481.3(5)	$\langle \leq 2 \rangle$												
1491.4(2)						6.5		81De29					
1501.1(4)	$\langle \leq 2^- \rangle$												
1515.4(3)	$\langle 0^-, 2^- \rangle$							96Va23	3			10(7)	
1518.1(10)													
1526.0(13)	$\langle \leq 2^- \rangle$												
1532.1(16)	$\langle \leq 2^- \rangle$												
1537.2(9)	$\langle 1^- \rangle$												
1539(13)	$\langle 4^- \rangle$				2	2.1		81De29					
1549.1(13)*								96Va23	50(16)	50(16)			
1566(8)						1.8		81De29					
1586.7(25)*								96Va23		3(3)		16(5)	
1590.3(5)*						2.1		81De29	40(20)	60(20)			
1603.5(14)*										12(3)			
1609.3(11)*	$\langle 0^-, 1^-, 2^- \rangle$							96Va23	12				
1639.2(5)*						2.7		81De29		29(14)	71(29)		

(continued)

 $^{170}_{69}\text{Tm}$

E^*	J^π	L	σ (d,p)	L	K	σ (t, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(d,p)	$\mu\text{b/sr}$	(t, α)		$\mu\text{b/sr}$	Γ_{cm}		E^*_f : J^π_f :	0.0 1 ⁻	38.7 $\langle 2 \rangle^-$	114.5 $\langle 3 \rangle^-$	149.7 $\langle 0 \rangle^-$
1646.3(11)													
1658.7(12)*								96Va23		23(4)	8(4)		
1669.2(4)*								96Va23		4(2)			11(4)
1676(3)	$\langle 1^- \rangle$					4.9		81De29					
1690(8)													
1704.8(4)*						2.2		81De29		50(16)	50(16)		
1726.7(15)*								96Va23			6(3)		
1733.7(4)*								96Va23		50(10)	50(10)		
1747.7(11)*						4.4		81De29		27(7)	47(7)		
1758.4(4)*								96Va23		25(8)	33(8)	42(17)	
1768.7(12)													
1793(3)	$\langle 1^- \rangle$												
1818.1(14)													
1823.2(6)	$\langle 0^-, 1^-, 2^- \rangle$					14.6		81De29					57(14)
1846(3)	$\langle 1^- \rangle$					5.4		81De29					
1855.0(5)													
1859.3(15)*	$\langle 1^- \rangle$							96Va23		5(1)	7(1)	5(2)	9(2)
1870.6(8)						7.0		81De29					
1909.8(5)*								96Va23		57(14)	43(14)		
1921.3(14)*								96Va23				15(3)	
1932.7(12)*								96Va23		12(6)	29(6)		
1944(3)	$\langle 0^-, 2^- \rangle$												
1951.0(8)*	$\langle 0^-, 1^-, 2^- \rangle$							96Va23		7(3)			
1979.0(14)*								96Va23		12(6)	35(12)		
2013.4(17)*								96Va23		4(4)	8(4)	44(8)	
2039.5(13)*								96Va23		15(15)			
2072.8(9)*								96Va23		25(13)			
2084.1(14)*								96Va23		25(25)			
2098.0(12)*								96Va23					46(16)
2101.0(17)*								96Va23		3(3)	10(3)		
2116.3(10)*								96Va23					44(13)
2134.6(15)*								96Va23			14(3)	25(6)	
2145.4(8)*								96Va23		40(20)	60(20)		
2161.1(21)*								96Va23		9(4)			
2168.1(7)*								96Va23		9(3)			
2192.0(23)*								96Va23		10(5)			
2258.2(20)*								96Va23					45(9)
2264.9(7)*								96Va23					
2272.4(5)*								96Va23					
2281.5(5)*								96Va23					
2283.1(11)*								96Va23		10(2)	16(2)		
2289.8(12)*								96Va23		22(11)	33(11)		
2307.4(13)*								96Va23			19(6)		
2340.8(7)*								96Va23					
2347.1(15)*								96Va23			29(14)		

(continued)

 $^{170}\text{Tm}_{69}$

E^*	J^π	L	σ (d,p)	L	K	σ (t, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(d,p)	$\mu\text{b/sr}$	(t, α)		$\mu\text{b/sr}$	Γ_{cm}		E_f^* : J_f^π :	0.0 1 ⁻	38.7 (2) ⁻	114.5 (3) ⁻	149.7 (0) ⁻
2364.8(13)*								96Va23			18(4)		
2388.2(5)*								96Va23		12			
2439.1(19)*								96Va23		3			30(5)
2458.3(4)*								96Va23		33(7)	47(7)		
2478.0(7)*								96Va23		17(4)			
2482.0(5)*								96Va23		33(17)	67(17)		
2528.5(6)*								96Va23				44(22)	
2536.3(20)*								96Va23		19(3)			
2540.5(6)*								96Va23		17(8)			
2553.9(20)*								96Va23					
2573.2(7)*								96Va23			20(10)		
2587.6(9)*								96Va23		17(9)	17(9)		
2592.3(18)*								96Va23				12(6)	29(6)
2598.9(21)*								96Va23		4(1)	4(1)	8(3)	
2606.8(17)*								96Va23		7(4)		19(7)	19(7)
2618.3(13)*								96Va23		4(2)		15(2)	
2625.7(7)*								96Va23					
2634.6(16)*								96Va23				25(8)	
2671.9(7)*								96Va23					
2702.3(19)*								96Va23				26(11)	42(11)
2721.3(15)*								96Va23					
2727.4(5)*								96Va23				35(12)	
2767.9(5)*								96Va23					
2778.6(15)*								96Va23		12(6)		38(12)	
2802.4(5)*								96Va23		40(20)	60(23)		
2807.8(14)*								96Va23		9(2)			
2813.6(15)*								96Va23		9(3)	20(6)		12(9)
2846.2(5)*								96Va23		39(8)			
2867.0(13)*								96Va23					
2874.5(5)*								96Va23		25(8)			
2881.0(5)*								96Va23		44(11)			
2911.9(21)*								96Va23		27(24)			
2925.4(6)*								96Va23					
2952.7(5)*								96Va23					
2995.9(6)*								96Va23		25(13)			
3030.8(13)*								96Va23					
3099.4(9)*								96Va23					
3206.9(7)*								96Va23			44(11)	56(22)	
3215.9(9)*								96Va23					
3272.7(6)*								96Va23					
3470.8(5)*								96Va23			29(7)		
3491.5(11)*								96Va23					
3557.3(7)*								96Va23			33(9)		
3623.7(6)*								96Va23					
3630.0(6)*								96Va23			50(16)		

(continued)

 $^{170}_{69}\text{Tm}$

E^*	J^π	L	σ (d,p)	L	K	σ (t, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(d,p)	$\mu\text{b/sr}$	(t, α)		$\mu\text{b/sr}$	Γ_{cm}		E_f^* :	0.0	38.7	114.5	149.7
									J_f^π :	1^-	$\langle 2 \rangle^-$	$\langle 3 \rangle^-$	$\langle 0 \rangle^-$
3760.5(11)*								96Va23					
3806.2(6)*								96Va23	22(11)				
3864.1(20)*								96Va23					
15492(7)	0^+						104(8) keV						
		96Ho12	02Ba93			81De29		Ref.					

Additional data on this isotope can be found in [96Va23, 66Ry01, 66Sh03].

* E_m^* introduced as the intermediate state in ($n_{\text{thermal}}, \gamma\gamma$) measurements [96Va23].Differential cross section σ (d,p) were measured at 20°, 25°, 30°, 40° and 45° [96Ho12], data for 30° are presented here.The second column contains σ (t, α) measured at 30° and K-values from [81De29] as well as L-values from [02Ba93].

Energy levels and branching ratios [02Ba93]. Part 2

 $^{170}_{69}\text{Tm}$

E^*	J^π	Branching ratios in percentage										
[keV]		E_f^* :	183.19	183.20	204.5	219.7	237.2	247.1	270.5	319.3	349.7	
		J_f^π :	$\langle 4 \rangle^-$	$\langle 3 \rangle^+$	$\langle 2 \rangle^-$	$\langle 2 \rangle^-$	$\langle 1 \rangle^-$	$\langle 4 \rangle^+$	$\langle 3 \rangle^-$	$\langle 5 \rangle^-$	$\langle 3 \rangle^-$	
237.240(1)	$\langle 1 \rangle^-$					0.20(2)						
247.147(6)	$\langle 4 \rangle^+$		13(2)	87(11)								
270.547(1)	$\langle 3 \rangle^-$		x		43(4)							
349.733(1)	$\langle 3 \rangle^-$				x	25.4(8)	0.82(8)					
355.047(6)	$\langle 4 \rangle^+$		74(8)	16(2)				10.4(8)				
358.116(1)	$\langle 4 \rangle^-$		7.3(8)		26(2)				57(2)			
381.426(1)	$\langle 4 \rangle^-$		12.9(7)			42(2)					2.4(2)	
447.071(1)	$\langle 3 \rangle^-$			1.1(1)	64(1)				20.5(6)			
467.8607(12)	$\langle 5 \rangle^-$								57(6)			
539.7223(17)	$\langle 4 \rangle^-$				8.1(13)				42(5)			
550.7473(17)	$\langle 5 \rangle^-$		64(3)							7.6(8)		
590.2286(17)	$\langle 1 \rangle^-$					3.2(1)	16(1)					
594.2(4)									x			
603.9897(14)	$\langle 1 \rangle^+$					4.94(7)						
607.8862(16)	$\langle 3 \rangle^+$			30.7(6)		6.62(8)						
637.9062(21)	$\langle 2 \rangle^-$					2.69(10)	7.0(5)					
648.7467(14)	$\langle 1 \rangle^-$					7.80(7)	66(2)		0.66(3)			
650.3735(14)	$\langle 2 \rangle^+$						2.60(7)				1.2(1)	
661.8564(12)	$\langle 1 \rangle^+$				17(1)	18.2(3)						
683.569(3)	$\langle 0 \rangle^-$						100					
693.2864(13)	$\langle 2 \rangle^-$			x	x	14.2(10)	54.5(5)				9.6(4)	
703.6284(13)	$\langle 2 \rangle^+$				x	2.82(5)	2.0(1)		3.83(10)			
708.370(4)	$\langle 3 \rangle^-$		15.6(2)									
709.474(4)	$\langle 1,2,3 \rangle^-$				84(3)							
715.6207(18)	$\langle 3 \rangle^-$			60(2)				12.0(5)			1.9(4)	

(continued)

 ^{170}Tm

E^* [keV]	J^π	Branching ratios in percentage									
		E_f^* : J_f^π :	183.19 $\langle 4 \rangle^-$	183.20 $\langle 3 \rangle^+$	204.5 $\langle 2 \rangle^-$	219.7 $\langle 2 \rangle^-$	237.2 $\langle 1 \rangle^-$	247.1 $\langle 4 \rangle^+$	270.5 $\langle 3 \rangle^-$	319.3 $\langle 5 \rangle^-$	349.7 $\langle 3 \rangle^-$
719.2627(23)	$\langle 1 \rangle^+$					20.4(3)					
733.8128(21)	$\langle 2 \rangle^-$						30.8(5)				67(5)
749.8482(16)	$\langle 3 \rangle^-$						5.6(4)				55(2)
756.215(6)	$\langle 4 \rangle^-$			100							
758.3294(17)	$\langle 2 \rangle^+$			11.2(4)	x	27.0(13)			12.0(8)		x
760.4(8)											x
775.2299(14)	$\langle 0 \rangle^+$						98.2(16)				
782.1520(22)	$\langle 1 \rangle^-$					50.3(10)					
806.4274(24)	$\langle 4 \rangle^-$				53.2(13)						
818.5072(15)	$\langle 2 \rangle^+$						19.2(5)				15.0(5)
822.3935(15)	$\langle 2 \rangle^+$						43.9(10)		x		26.1(6)
832.6(5)			67(22)				33(11)				
839.131(4)	$\langle 3 \rangle^-$				3.71(17)	18.0(5)					
850.2(19)				22(8)	8(4)	22(6)	12(2)				
854.335(4)	$\langle 2 \rangle^-$				x	x	x				
860.484(3)	$\langle 1 \rangle^+$					50.3(10)					
862.7765(21)	$\langle 3 \rangle^-$		16.3(3)		x						
863.364(5)	$\langle 1 \rangle^-$				99(3)	x	x				
868.0(8)						71(29)					
908.448(3)	$\langle 2^- \rangle$			16(6)	33.2(10)				47.0(8)		
925.2722(22)	$\langle 3 \rangle^-$				54.5(4)						x
964.474(7)	$\langle 3,4 \rangle^-$		36.0(5)		8.8(5)	28(2)					
964.8(10)									35(12)		
979.929(4)	$\langle 3 \rangle^-$								30.2(7)		
984.981(7)	$\langle 3-5 \rangle^-$								43(3)		
1057.3(9)				83(14)					17(6)		
1070.975(6)	$\langle 2 \rangle^-$				65.3(10)				<13.4		
1072.7(4)					39(5)	20(3)	33(4)				
1087.8(10)						45(9)	55(27)				
1101.999(4)	$\langle 2^+ \rangle$						31(8)				
1139.951(4)	$\langle 2 \rangle^-$						9(2)		34(1)		35.6(6)
1147.974(4)	$\langle 1,2 \rangle^-$				25.4(4)	43.4(7)			x		
1160.597(3)	$\langle 1 \rangle^-$				50.1(11)				14.8(5)		
1168.779(5)	$\langle 2 \rangle^-$				27(1)		47(6)				
1178.910(3)	$\langle 2 \rangle^-$			4.3(4)	4(2)	5.3(2)	3.1(8)		8(4)		
1182.3(15)					38(12)		62(12)				
1192.828(10)	$\langle 2 \rangle^-$					18.6(6)	7(2)				
1238.144(10)	$\langle 1,2 \rangle^-$					29(1)	40.7(9)				
1265.07(1)	$\langle 0,1,2 \rangle^-$		x	x	x	13.6(5)	46(1)		x		
1279.5(3)	$\langle \leq 2^- \rangle$					x					
1299.107(13)	$\langle 2 \rangle^-$				x	x	45(2)				
1354.6(2)	$\langle 2 \rangle^-$					31(9)					
1363.5(5)*				26(5)		22(3)					
1375.1(2)	$\langle 1^- \rangle$						31(8)				
1382.2(9)*	$\langle 2 \rangle^-$				78(22)						

(continued)

 $^{170}_{69}\text{Tm}$

E^* [keV]	J^π	Branching ratios in percentage									
		$E_f^*:$ $J_f^\pi:$	183.19 $\langle 4 \rangle^-$	183.20 $\langle 3 \rangle^+$	204.5 $\langle 2 \rangle^-$	219.7 $\langle 2 \rangle^-$	237.2 $\langle 1 \rangle^-$	247.1 $\langle 4 \rangle^+$	270.5 $\langle 3 \rangle^-$	319.3 $\langle 5 \rangle^-$	349.7 $\langle 3 \rangle^-$
1395.0(2)	$\langle \leq 2^- \rangle$			29(7)		19(4)	11(4)				
1413.1(19)							39(11)				33(11)
1433.2(3)						16(3)					84(5)
1437.2(11)						11(3)	73(8)				
1442.0(4)					100						
1443.1(4)*	$\langle 1^- \rangle$				10(2)	57(5)	7(3)				12(3)
1466.3(2)	$\langle \leq 2^- \rangle$					5.6(9)	8(2)				6(2)
1478.0(10)						36(9)					
1501.1(4)	$\langle \leq 2^- \rangle$				56(11)	28(6)	17(6)				
1515.4(3)	$\langle 0^-, 2^- \rangle$					30(7)	17(7)				
1518.1(10)							43(5)				34(7)
1537.2(9)	$\langle 1^- \rangle$					33(11)					
1586.7(25)*					11(3)						
1603.5(14)*							62(6)				
1658.7(12)*						27(4)					
1669.2(4)*					33(4)		7(2)				
1726.7(15)*					11(3)				44(6)		
1747.7(11)*							27(7)				
1818.1(14)					28(9)		72(9)				
1823.2(6)	$\langle 0^-, 1^-, 2^- \rangle$					43(7)					
1855.0(5)				32(5)							
1859.3(15)*	$\langle 1^- \rangle$					4(1)	13(2)				8(2)
1870.6(8)					18(4)		15(4)				
1921.3(14)*											44(4)
1932.7(12)*											29(12)
1951.0(8)*	$\langle 0^-, 1^-, 2^- \rangle$			20(7)		13(3)			23(10)		
1979.0(14)*									53(17)		
2013.4(17)*				22(8)	11(4)		11(4)				
2039.5(13)*						85(15)					
2072.8(9)*											75(25)
2084.1(14)*							75(25)				
2098.0(12)*											54(16)
2101.0(17)*					13(3)		16(3)		58(10)		
2116.3(10)*					31(6)	25(6)					
2134.6(15)*						14(3)	8(3)		28(8)		
2161.1(21)*					29(5)				62(14)		
2168.1(7)*					54(6)				37(9)		
2258.2(20)*						14(5)	9(5)				
2272.4(5)*					40(10)						
2281.5(5)*						71(14)	29(14)				
2283.1(11)*											18(5)
2289.8(12)*						44(11)					
2307.4(13)*							12(6)				
2340.8(7)*							12(4)				
2364.8(13)*											27(9)

(continued)

 $^{170}_{69}\text{Tm}$

E^*	J^π	Branching ratios in percentage									
[keV]		$E_f^*:$ $J_f^\pi:$	183.19 $\langle 4 \rangle^-$	183.20 $\langle 3 \rangle^+$	204.5 $\langle 2 \rangle^-$	219.7 $\langle 2 \rangle^-$	237.2 $\langle 1 \rangle^-$	247.1 $\langle 4 \rangle^+$	270.5 $\langle 3 \rangle^-$	319.3 $\langle 5 \rangle^-$	349.7 $\langle 3 \rangle^-$
2388.2(5)*						88(25)					
2439.1(19)*											20(5)
2478.0(7)*				43(13)					39(13)		
2528.5(6)*					56(11)						
2536.3(20)*							9(3)				
2540.5(6)*									83(25)		
2553.9(20)*					28(6)	22(6)					
2573.2(7)*					50(10)		30(10)				
2592.3(18)*						9(3)			26(9)		
2598.9(21)*					16(3)				25(5)		13(4)
2606.8(17)*									29(11)		
2618.3(13)*					9(2)				26(7)		
2625.7(7)*					10(3)						
2634.6(16)*							17(8)				
2671.9(7)*									44(19)		
2702.3(19)*						32(11)					
2721.3(15)*					67(17)		33(17)				
2727.4(5)*									65(17)		
2767.9(5)*				52(17)							
2778.6(15)*									50(19)		
2807.8(14)*						11(4)					13(4)
2813.6(15)*						x			35(12)		
2867.0(13)*									41(14)		
2874.5(5)*									75(25)		
2881.0(5)*					56(22)						
2911.9(21)*							73(24)				
2925.4(6)*									47(17)		
2952.7(5)*							31(8)				69(23)
2995.9(6)*											75(25)
3272.7(6)*					26(13)						
3470.8(5)*					71(14)						
3491.5(11)*							29(14)				
3557.3(7)*											67(25)
3623.7(6)*					36(14)						64(21)
3630.0(6)*							50(16)				
3760.5(11)*						33(11)					
3806.2(6)*											78(33)
3864.1(20)*			60(12)			10(5)	8(2)				

Energy levels and branching ratios [02Ba93]. Part 3

¹⁷⁰Tm
69

E^* [keV]	J^π	Branching ratios in percentage									
		E_f^* : J_f^π :	358.1 $\langle 4 \rangle^-$	381.4 $\langle 4 \rangle^-$	402.7 $\langle 3,4 \rangle^-$	447.071 $\langle 3 \rangle^-$	467.861 $\langle 5 \rangle^-$	539.722 $\langle 4 \rangle^-$	544.050 $\langle 3^+ \rangle$	590.229 $\langle 1 \rangle^-$	594.2
447.071(1)	$\langle 3 \rangle^-$		2.4(5)								
467.8607(12)	$\langle 5 \rangle^-$		43(8)								
539.7223(17)	$\langle 4 \rangle^-$					49(3)					
550.7473(17)	$\langle 5 \rangle^-$		12.1(8)	17(3)							
607.8862(16)	$\langle 3 \rangle^+$			1.0(2)							
715.6207(18)	$\langle 3 \rangle^-$					23(3)		2.5(2)			
749.8482(16)	$\langle 3 \rangle^-$			7.8(3)							
775.2299(14)	$\langle 0 \rangle^+$									1.81(23)	
806.4274(24)	$\langle 4 \rangle^-$		25.9(6)			20.9(13)					
862.7765(21)	$\langle 3 \rangle^-$			15.2(4)		5.15(14)					
863.364(5)	$\langle 1 \rangle^-$					0.79(7)					
925.2722(22)	$\langle 3 \rangle^-$						3(3)				
964.474(7)	$\langle 3,4 \rangle^-$		15(1)		6.8(8)	5.5(5)					
979.929(4)	$\langle 3 \rangle^-$		35(2)			35(1)					
984.981(7)	$\langle 3-5 \rangle^-$		31.8(7)		25(7)						
1070.975(6)	$\langle 2 \rangle^-$								2.27(13)		
1101.999(4)	$\langle 2^+ \rangle$					x					
1139.951(4)	$\langle 2 \rangle^-$		12.6(7)								
1147.974(4)	$\langle 1,2 \rangle^-$									7.40(8)	
1160.597(3)	$\langle 1 \rangle^-$					5.4(4)					
1192.828(10)	$\langle 2 \rangle^-$									3.9(4)	
1200.7(15)										64(21)	
1210.679(11)	$\langle 2^+ \rangle$								7.3(3)		x
1238.144(10)	$\langle 1,2 \rangle^-$								12(9)		
1299.107(13)	$\langle 2 \rangle^-$		10.8(10)								
1309.3(17)										33(17)	
1315.9(13)	$\langle 1 \rangle^-$					59(15)					
1466.3(2)	$\langle \leq 2^- \rangle$					29(4)					
1515.4(3)	$\langle 0^-, 2^- \rangle$									27(10)	
1518.1(10)										23(7)	
1586.7(25)*						31(11)				39(8)	
1603.5(14)*										25(9)	
1609.3(11)*	$\langle 0^-, 1^-, 2^- \rangle$									88(34)	
1669.2(4)*										45(7)	
1726.7(15)*						39(8)					
1768.7(12)						56(19)				44(19)	
1859.3(15)*	$\langle 1^- \rangle$					13(3)					
1870.6(8)										26(11)	
1921.3(14)*						14(6)					
1951.0(8)*	$\langle 0^-, 1^-, 2^- \rangle$					37(13)					
2283.1(11)*						41(10)					
2307.4(13)*						69(19)					
2340.8(7)*						50(16)				38(12)	
2536.3(20)*						31(9)				22(9)	
2553.9(20)*										50(16)	

(continued)

 $^{170}_{69}\text{Tm}$

E^* [keV]	J^π	Branching ratios in percentage								
		$E_f^*:$ $J_f^\pi:$	358.1 $\langle 4 \rangle^-$	381.4 $\langle 4 \rangle^-$	402.7 $\langle 3,4 \rangle^-$	447.071 $\langle 3 \rangle^-$	467.861 $\langle 5 \rangle^-$	539.722 $\langle 4 \rangle^-$	544.050 $\langle 3^+ \rangle$	590.229 $\langle 1 \rangle^-$
2587.6(9)*										67(25)
2598.9(21)*						13(4)				
2618.3(13)*						24(7)				
2767.9(5)*										48(13)
2807.8(14)*						29(9)				18(7)
2813.6(15)*						24(12)				
2846.2(5)*										61(23)
3030.8(13)*										64(21)
3099.4(9)*						55(25)				
3215.9(9)*										39(18)
3272.7(6)*										74(26)
3864.1(20)*										23(10)

Energy levels and branching ratios [02Ba93]. Part 4

 $^{170}_{69}\text{Tm}$

E^* [keV]	J^π	Branching ratios in percentage								
		$E_f^*:$ $J_f^\pi:$	598.8 $\langle 6^- \rangle$	603.990 $\langle 1 \rangle^+$	607.886 $\langle 3 \rangle^+$	644 $\langle 4^- \rangle$	648.747 $\langle 1 \rangle^-$	650.374 $\langle 2 \rangle^+$	661.856 $\langle 1 \rangle^+$	683.569 $\langle 0 \rangle^-$
703.6284(13)	$\langle 2 \rangle^+$			3.1(2)					1.4(1)	
758.3294(17)	$\langle 2 \rangle^+$							50(2)		
782.1520(22)	$\langle 1 \rangle^-$									3.9(5)
818.5072(15)	$\langle 2 \rangle^+$			1.16(10)						
822.3935(15)	$\langle 2 \rangle^+$			1.0(1)						
1064.4579(14)	$\langle 1 \rangle^+$			19(1)						6.1(1)
1070.975(6)	$\langle 2 \rangle^-$						1.74(13)			
1101.999(4)	$\langle 2^+ \rangle$				1.36(12)					
1139.951(4)	$\langle 2 \rangle^-$						3.2(2)			
1147.974(4)	$\langle 1,2 \rangle^-$									0.65(8)
1160.597(3)	$\langle 1 \rangle^-$									8.7(7)
1168.779(5)	$\langle 2 \rangle^-$									26(1)
1178.910(3)	$\langle 2 \rangle^-$								4.8(2)	
1192.828(10)	$\langle 2 \rangle^-$			18(4)						
1200.7(15)				36(14)						
1265.07(1)	$\langle 0,1,2 \rangle^-$				x					
1299.107(13)	$\langle 2 \rangle^-$			7.8(4)			x			
1309.3(17)				22(11)			44(17)			
1363.5(5)*						14(5)				
1437.2(11)				16(5)						
1466.3(2)	$\langle \leq 2^- \rangle$		5(2)							
1478.0(10)				27(18)						
1515.4(3)	$\langle 0^-, 2^- \rangle$			13(7)						
1537.2(9)	$\langle 1^- \rangle$			67(22)						

(continued)

¹⁷⁰Tm
69

E^*	J^π	Branching ratios in percentage									
[keV]		E_f^* : J_f^π :	598.8 $\langle 6^- \rangle$	603.990 $\langle 1 \rangle^+$	607.886 $\langle 3 \rangle^+$	644 $\langle 4^- \rangle$	648.747 $\langle 1 \rangle^-$	650.374 $\langle 2 \rangle^+$	661.856 $\langle 1 \rangle^+$	683.569 $\langle 0 \rangle^-$	693.286 $\langle 2 \rangle^-$
1646.3(11)	$\langle 1^- \rangle$			36(18)		64(36)					
1658.7(12)*						42(15)					
1855.0(5)						68(26)					
1859.3(15)*				3(1)		31(8)					
1870.6(8)				15(4)		26(4)					
1921.3(14)*				11(1)		17(4)					
1932.7(12)*							29(18)				
2134.6(15)*			11(3)								
2192.0(23)*			33(5)			57(14)					
2258.2(20)*							32(14)				
2264.9(7)*		40(7)			60(20)						
2272.4(5)*				60(10)							
2283.1(11)*				16(2)							
2347.1(15)*				71(29)							
2364.8(13)*						55(14)					
2439.1(19)*				28(8)		20(8)					
2458.3(4)*				20(14)							
2536.3(20)*				19(3)							
2592.3(18)*						24(9)					
2598.9(21)*				5(3)		12(4)					
2606.8(17)*				26(7)							
2618.3(13)*						22(7)					
2625.7(7)*				90(7)							
2634.6(16)*				58(8)							
2671.9(7)*						56(19)					
2807.8(14)*						20(7)					
2867.0(13)*						59(14)					
2925.4(6)*						53(17)					
3030.8(13)*				36(14)							
3099.4(9)*						45(20)					
3215.9(9)*						61(18)					
3491.5(11)*						71(29)					
3760.5(11)*						67(22)					

Energy levels and branching ratios [02Ba93]. Part 5

¹⁷⁰Tm
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E^*	J^π	Branching ratios in percentage									
[keV]		E_f^* :	703.628	709.474	715.621	719.263	733.813	775.230	782.152	818.507	822.394
		J_f^π :	$\langle 2 \rangle^+$		$\langle 3 \rangle^-$	$\langle 1 \rangle^+$	$\langle 2 \rangle^-$	$\langle 0 \rangle^+$	$\langle 1 \rangle^-$	$\langle 2 \rangle^+$	$\langle 2 \rangle^+$
854.335(4)	$\langle 2 \rangle^-$			1.11(12)							
1064.4579(14)	$\langle 1 \rangle^+$		15.4(2)			5.7(1)		9(1)		14(2)	14(2)
1078.8484(15)	$\langle 1 \rangle^+$							18(2)		11.0(13)	13(2)

(continued)

 $^{170}_{69}\text{Tm}$

E^* [keV]	J^π	Branching ratios in percentage									
		$E_f^*:$ $J_f^\pi:$	703.628 $\langle 2 \rangle^+$	709.474	715.621 $\langle 3 \rangle^-$	719.263 $\langle 1 \rangle^+$	733.813 $\langle 2 \rangle^-$	775.230 $\langle 0 \rangle^+$	782.152 $\langle 1 \rangle^-$	818.507 $\langle 2 \rangle^+$	822.394 $\langle 2 \rangle^+$
1101.999(4)	$\langle 2^+ \rangle$					2.7(5)					
1160.597(3)	$\langle 1 \rangle^-$						16.5(2)				
1178.910(3)	$\langle 2 \rangle^-$				1.03(4)				0.52(4)		
1238.144(10)	$\langle 1,2 \rangle^-$						3.8(1)				

Energy levels and branching ratios [02Ba93]. Part 6

 $^{170}_{69}\text{Tm}$

E^* [keV]	J^π	Branching ratios in percentage			
		$E_f^*:$ $J_f^\pi:$	860.484 $\langle 1 \rangle^+$	863.364 $\langle 1 \rangle^-$	908.448 $\langle 2^- \rangle$
1064.4579(14)	$\langle 1 \rangle^+$		9(1)		
1091.583(3)	$\langle 1,2 \rangle$		18(2)		
1139.951(4)	$\langle 2 \rangle^-$			1.3(2)	3.9(6)
1160.597(3)	$\langle 1 \rangle^-$			0.90(11)	1.68(11)
1299.107(13)	$\langle 2 \rangle^-$		1.1(1)		

Energy levels and branching ratios [02Ba87].

 $^{171}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	$2J^\pi$ (τ, d)	C^2S (τ, d)	σ (τ, d) $\mu\text{b/sr}$	S_N (α, t)	σ (α, t) $\mu\text{b/sr}$	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
									$E_f^*:$ $2J_f^\pi:$	0.0 1+	5.0 3+	117 5+	129 7+	327 9+
0.0	1^+	1^+		30.6		64.5	1.92(1) yr	74Ch44						
5.0361(11)	3^+	3^+	$\langle 0.67 \rangle$	incl	$\langle 0.65 \rangle$	incl	4.77(8) ns	74Ch44	100					
116.657(1)	5^+	5^+	0.37	17.8	0.28	29.8	55(13) ps	74Ch44	10.3(7)	89.7(14)				
129.054(1)	7^+	7^+	0.28	3.6	0.15	3.1	415(20) ps	74Ch44		100		0.33(2)		
326.811(1)	9^+	9^+	0.07	1.6	0.04	1.2		74Ch44				34(3)	66(3)	
347.960(2)	11^+												100	
424.956(2)	7^-	7^-	0.02		0.01	1.4	2.60(2) μs	74Ch44	0.02(1)	0.09(1)	66.3(14)	33.6(17)		
520.319(2)	$\langle 9^- \rangle$	9^-	0.04		0.02			74Ch44						
627.02(4)	$\langle 13^+ \rangle$													49(2)
635.540(2)	7^+	7^+	$\langle 1.70 \rangle$	11.6	$\langle 1.81 \rangle$	72.3	1.26(6) ns	74Ch44		0.70(14)	3.1(7)	3.1(3)		
637.14(5)	$\langle 11^- \rangle$			incl		incl								
658.77(3)	$\langle 15^+ \rangle$													
675.80(1)	3^+	3^+	0.02	1.3	0.04	2.1		74Ch44	48.7(10)	43.3(9)	8.0(3)			
737.42(9)	$\langle 5 \rangle^+$	5^+	0.33	13.9	0.24	15.3		74Ch44		43.7(11)	40(1)	≈ 17		
743.768(20)	$\langle 9^+ \rangle$													
750.109(19)	$\langle 5^- \rangle$	5^-	0.64	44.6	0.39	33.3		74Ch44		100			< 87	
754.841(5)	$\langle 1^- \rangle$								57(23)	43(40)				
775.87(4)	$\langle 13^- \rangle$													

(continued)

¹⁷¹Tm
69

E^*	$2J^\pi$	$2J^\pi$	C^2S	σ (τ ,d)	S_N	σ (α ,t)	Ref.	Branching ratios in percentage					
[keV]		(τ ,d)	(τ ,d)	μ b/sr	(α ,t)	μ b/sr		E_f^* : $2J_f^\pi$:	0.0 1+	5.0 3+	117 5+	129 7+	327 9+
822.429(24)	$\langle 7^+ \rangle$			9.2		50.9	74Ch44				41(14)	51(6)	8(3)
824.08(22)	$\langle 9^- \rangle$	9-	1.11	incl	1.19	incl	74Ch44					x	x
872.80(15)	$\langle 11^+ \rangle$												
884.34(3)	$\langle 3 \rangle^-$	3-	0.13	27.3	0.05	5.1	74Ch44	[100]					
912.946(3)	5^+	5+	0.65	32.9	0.60	37.0	74Ch44	2.7(2)	22.2(5)	23		8.4(2)	9(1)
935.56(8)	$\langle 15^- \rangle$												
984.46(20)	$\langle 13^- \rangle$												
998.625(3)	$\langle 7 \rangle^+$								0.3(1)	19(1)	27(2)	11(2)	
1013.15(7)	$\langle 17^+ \rangle$												
1036.26(24)	$\langle 7^- \rangle$	7-	0.13	8.8	0.09	10.9	74Ch44				x		x
1057.42(8)	$\langle 19^+ \rangle$												
1116.76(13)	$\langle 17^- \rangle$												
1225.7(4)	$\langle 3^+, 5, 7^+ \rangle$								26(2)	64(2)	10(2)		
1232.17(11)	$\langle 17^- \rangle$												
1235(2)				4.4		1.5	74Ch44						
1284.967(4)	$\langle 5 \rangle^+$			34.5		25.4	74Ch44	0.77(7)	0.80(7)	0.59(5)	0.19(5)		
1296.46(20)													
1306.96(17)	$\langle 11 \rangle^-$	11-	0.95	9.2	0.80	34.8	74Ch44						
1316.56(22)	$\langle 19^- \rangle$												
1391.1(4)	$3^{\langle - \rangle}, 5, 7$												
1400.6(3)	$\langle 5 \rangle^+$							39(2)	44(13)			5(2)	
1568.1(6)	1^+			18.2		3.0	74Ch44						
1785.2(9)				7.9		2.9	74Ch44						
1813.0(10)													
1824.5(9)	1^+			34.6		2.3	74Ch44						
1848.5(10)				26.1		1.9	74Ch44						
1859.8(12)				incl		incl							
1908.8(10)													
1925.7(11)													
1959.4(13)													
1979.4(17)													
2015.3(12)													
				74Ch44	74Ch44	74Ch44	74Ch44	Ref.					

Additional data on this isotope can be found in [94Sc51].

 σ (τ ,d) and σ (α ,t) were measured at 25° and 45°, respectively; see data for 60° in [74Ch44].

Data for this isotope are considered in vol. LB I/18C.

Energy levels and branching ratios [02Ba87]. Part 2

¹⁷¹₆₉Tm

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]	(τ, d)	E_f^* : $2J_f^\pi$:	348 11+	425 7−	520 ⟨9−⟩	627.02 ⟨13+⟩	635.540 7+	637.14 ⟨11−⟩	658.77 ⟨15+⟩	675.799 3+	737.42 ⟨5⟩+	743.768 ⟨9+⟩
520.319(2)	9−			100								
627.02(4)			51(6)									
635.540(2)	7+			89.1(13)	3.9(19)							
637.14(5)					100							
658.77(3)		100										
737.42(9)	5+									x		
743.768(20)							100					
775.87(4)					22(2)			77.5(19)				
822.429(24)							x				x	
824.08(22)	9−	x										
872.80(15)							x					x
912.946(3)	5+			0.2(1)			20(1)			10.6(3)	5(1)	
935.56(8)								32(1)				
984.46(20)		100										
998.625(3)				4.8(7)			9.6(5)				<10	
1013.15(7)						51(3)			49(5)			
1057.42(8)									100			
1232.17(11)									100			
1284.967(4)				0.48(7)						≈7	5.4(13)	
1296.46(20)				100								
1306.96(17)	11−				48(5)			26(8)				
1391.1(4)				100								
1400.6(3)				11(5)								

Energy levels and branching ratios [02Ba87]. Part 3

¹⁷¹₆₉Tm

E^* [keV]	$2J^\pi$ (τ ,d)	Branching ratios in percentage					
		E_f^* : $2J_f^\pi$:	775.87 <13->	912.946 5+	935.56 <15->	998.625 <7>+	1116.76 <17->
935.56(8)			68(7)				
998.625(3)				29(2)			
1116.76(13)			67(3)		33(3)		
1284.967(4)				83(3)		≈2.6	
1306.96(17)	11-		25(3)				
1316.56(22)					x		x

Energy levels and branching ratios [95Si16].

 $^{172}_{69}\text{Tm}$

E^* [keV]	J^π	$T_{1/2}$ or Γ_{cm}	Branching ratios in percentage							
			$E^*_f:$ $J^\pi_f:$	0.0 2^-	62.5 $\langle 3 \rangle^-$	145.8 $\langle 4^- \rangle$	239.9 $\langle 3^- \rangle$	407.3 $\langle 1 \rangle^-$	446.0 $\langle 2 \rangle^-$	475.4 $\langle 0 \rangle^-$
0.0	2^-	63.6(2) h								
62.529(4)	$\langle 3 \rangle^-$			100						
145.84(6)	$\langle 4^- \rangle$			30(20)	70(20)					
239.92(5)	$\langle 3^- \rangle$			92(6)	7.8(24)					
407.338(2)	$\langle 1 \rangle^-$	1.1(1) ns		99(2)	1.47(4)		0.017(2)			
446.036(4)	$\langle 2 \rangle^-$			55(1)	44.0(9)	0.39(2)	0.06(1)	0.13(4)		
475.446(2)	$\langle 0 \rangle^-$			24(1)				76(2)	0.17(5)	
479.68(9)	$\langle 1^-, 2^- \rangle$			47(5)	36(12)		17(3)			
496.34(12)				100						
526.23(5)	$\langle 0^- - 2^- \rangle$			37(26)	<26			11(5)	53(26)	
535.140(3)	$\langle 1 \rangle^-$	1.2(1) ns		5.7(2)	0.61(3)		0.05(3)	41.3(9)	0.09(1)	52(2)
610.062(2)	1^+	≤ 0.3 ns		96(2)	<0.001		0.003(1)	2.24(8)	1.46(6)	0.023(1)
714.50(9)	$\langle 0^-, 1 \rangle$			13(10)				79(17)		
797.42(10)	$\langle 0^-, 1 \rangle$			93(4)	<0.011					

Energy levels and branching ratios [95Si16]. Part 2

 $^{172}_{69}\text{Tm}$

E^* [keV]	J^π	Branching ratios in percentage			
		$E^*_f:$ $J^\pi_f:$	496.3	535.1 $\langle 1 \rangle^-$	610.1 1^+
610.062(2)	1^+		0.003(2)	0.26(1)	
714.50(9)	$\langle 0^-, 1 \rangle$			8(3)	
797.42(10)	$\langle 0^-, 1 \rangle$				7(7)

Energy levels and branching ratios [95Sh21].

 $^{173}_{69}\text{Tm}$

E^* [keV]	$2J^\pi$	$T_{1/2}$ or Γ_{cm}	Branching ratios in percentage						
			$E^*_f:$ $2J^\pi_f:$	0.0 $\langle 1^+ \rangle$	2.46 $\langle 3^+ \rangle$	118.60 $\langle 5^+ \rangle$	124.86 $\langle 7^+ \rangle$	317.73 $\langle 7^- \rangle$	411.9 $\langle 9^- \rangle$
0.0	$\langle 1^+ \rangle$	8.24(8) h							
2.46(14)	$\langle 3^+ \rangle$			100					
118.60(14)	$\langle 5^+ \rangle$			12(3)	88(13)				
124.86(15)	$\langle 7^+ \rangle$				100				
317.73(20)	$\langle 7^- \rangle$	10(3) μs			x	51	49(5)		
339.8(25)									
411.9(3)	$\langle 9^- \rangle$							100	
526.0(18)	$\langle 11^- \rangle$								
609.5(17)	$\langle 1^- \rangle$								
669.5(17)	$\langle 13^- \rangle$								

(continued)

¹⁷³Tm
69

E^* [keV]	$2J^\pi$	$T_{1/2}$ or Γ_{cm}	Branching ratios in percentage						317.73 $\langle 7^- \rangle$	411.9 $\langle 9^- \rangle$
			$E_f^*:$ $2J_f^\pi:$	0.0 $\langle 1^+ \rangle$	2.46 $\langle 3^+ \rangle$	118.60 $\langle 5^+ \rangle$	124.86 $\langle 7^+ \rangle$			
1212.9(4)	$\langle 9^- \rangle$								85(6)	15(5)
749.8(18)										
817.9(18)										
856.1(18)										
983.0(18)										
1137.0(22)										
1186.9(31)										
1243.5(27)										
1335.6(18)										
1361.5(29)										
1414.1(18)										
1439.4(29)										
1514.4(25)										
1588.2(18)										
1672.2(18)										
1703.3(26)										
1901.2(18)										
2005.9(25)										
2038.5(25)										
2069.0(23)										
2095.8(23)										
2126.7(23)										
2150.6(25)										
2192.0(28)										

Energy levels [99Br24, 06Ch10].

¹⁷⁴Tm
69

E^*	J^π	K	$T_{1/2}$ or	Ref.
[keV]			Γ_{cm}	
0.0	$\langle 4^- \rangle$	4	5.4(1) m	06Ch10 99Br24
100.4	$\langle 3^- \rangle$	3		06Ch10 99Br24
252.2	$\langle 0^+ \rangle$	0	2.29 s	06Ch10 99Br24
766.9				99Br24
772.9				99Br24

Additional data on this isotope can be found in [91Be04].

Discussion on low-lying levels in different schemes can be found in [06Ch10].

Energy levels and branching ratios [04Ba89].

¹⁷⁵Tm₆₉

E^*	$2J^\pi$	S_N	σ (t, α)	$T_{1/2}$ or	Ref.
[keV]		(t, α)	$\mu\text{b/sr}$	Γ_{cm}	
0.0	1 ⁺		230	15.2(5) m	79Lo09
2.6(8)	3 ⁺	≤ 0.70	incl		79Lo09
123.7(6)	5 ⁺	0.12	124		79Lo09
130.8(9)	7 ⁺	≤ 0.72	incl		79Lo09
357.9(7)	9 ⁺	0.11	16		79Lo09
439	$\langle 7^- \rangle$	0.081	26		79Lo09
532	$\langle 9^- \rangle$	0.13	13		79Lo09
611	$\langle 3^+ \rangle$	0.11	36		79Lo09
639.3(10)	$\langle 11^- \rangle$	2.1	207		79Lo09
672	$\langle 5^+ \rangle$	0.72	213		79Lo09
756	$\langle 7^+ \rangle$	0.18	29		79Lo09
870	$\langle 9^+ \rangle$	0.11	12		79Lo09
941	$\langle 15^- \rangle$		16		79Lo09
1004			6		79Lo09
1072			3		79Lo09
1146	$\langle 7^+, 3^+ \rangle$	0.16	18		79Lo09
1212	$\langle 7^-, 5^+ \rangle$	0.065	21		79Lo09
1291.2(9)					04Ba89
1367.7(11)	$\langle 7^+ \rangle$	0.096	13		79Lo09
1423	$\langle 5^+ \rangle$	0.23	62		79Lo09
1495	$\langle 7^-, 5^+ \rangle$	0.048	21		79Lo09
1583			9		79Lo09
1706	$\langle 5^+ \rangle$	0.11	29		79Lo09
1744			9		79Lo09
1810	$\langle 7^+ \rangle$	0.42	30		79Lo09
1916	$\langle 7^- \rangle$	0.24	80		79Lo09
1985	$\langle 5^+ \rangle$	0.16	63		79Lo09
2013			40		79Lo09
2056			60		79Lo09
2095	$\langle 11^- \rangle$	1.3	90		79Lo09
2216			48		79Lo09
2310			40		79Lo09
		79Lo09	79Lo09		Ref.

Additional data on this isotope can be found in [96Zh03].

Spectroscopic factor $S_N = (1/2N)(d\sigma/d\Omega_{\text{exp}}/d\sigma/d\Omega_{\text{DWBA}})$ with $N=23$ was used [79Lo09].Cross section of (t, α) reaction was measured at 30° [79Lo09].

5 bands of levels are considered in [04Ba89].

$${}^{175}_{69}\text{Tm}$$

E^*	$2J^\pi$	E_f^* :	0.0	Branching ratios in percentage				
[keV]		$2J_f^\pi$:	1^+	2.7 3^+	124 5^+	131 7^+	358 9^+	1291 X^+
2.6(8)	3^+		100					
123.7(6)	5^+		x	x				
130.8(9)	7^+			100				
357.9(7)	9^+				76	≈ 24		
639.3(10)	$\langle 11^- \rangle$						100	
1291.2(9)					100			
1367.7(11)	$\langle 7^+ \rangle$							x