

Energy levels and branching ratios [91Si01].

**⁸⁵Y
₃₉**

E^*	$2J^\pi$	L	$(2J+1)C^2S$	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, d)	Γ_{cm}		$\begin{smallmatrix} E^*_f: \\ 2J^\pi_f: \end{smallmatrix}$	$\begin{smallmatrix} 0.0 \\ \langle 1 \rangle^- \end{smallmatrix}$	$\begin{smallmatrix} 19.8 \\ 9^+ \end{smallmatrix}$	$\begin{smallmatrix} 266.3 \\ 5^- \end{smallmatrix}$	$\begin{smallmatrix} 416.4 \\ \langle 3 \rangle^- \end{smallmatrix}$	$\begin{smallmatrix} 436.1 \\ \langle 5 \rangle^+ \end{smallmatrix}$
0.0	$\langle 1 \rangle^-$	1	1.48	2.68(5) h	75Me17						
19.8(5)	9^+	4	6.0	4.86(13) h	75Me17		100				
266.30(20)	5^-	3	1.80	178(6) ns	75Me17		100				
416.36(17)	$\langle 3 \rangle^-$	1	0.96		75Me17		100				
436.1(4)	$\langle 5 \rangle^+$	2	0.20		75Me17			100			
474.0(4)	$5^+ - 9^+$							100			
636.7(4)	3^-	1	0.072		75Me17		100				
752(3)											
793.9(4)											100
803(4)	$3^+, 5^+$	2	0.041		75Me17						
814.8(4)	$\langle 13^+ \rangle$			2.36(14) ps				100			
884(3)	$3^+, 5^+$	2	0.015		75Me17						
936(3)	$1^-, 3^-$	1	0.054		75Me17						
964(3)	$1^-, 3^-$	1	0.138		75Me17						
1010.6(5)								100			
1179.6(4)	$\langle 11^+ \rangle$							59(2)			
1214(3)	$1^-, 3^-$	1	0.078		75Me17						
1218.2(4)	5,7,9							71(5)			25(2)
1274.1(5)	5,7,9	2	0.084		75Me17						22(11)
1280(3)	$3^+, 5^+$										
1310.8(5)	5,7,9							27(3)			27(3)
1378(3)	1^+	0	0.030		75Me17						
1393.3(5)	5,7,9										100
1422.9(6)											100
1433(3)		2	0.034		75Me17						
1607.9(6)	5^+	2	0.053		75Me17					100	
1648.5(4)	$\langle 13^+ \rangle$							18(3)			
1676(3)											
1724(4)	$3^+, 5^+$	2	0.040		75Me17						
1776(6)	$7^+, 9^+$	4	1.10		75Me17						
1797.6(4)	$\langle 17^+ \rangle$			1.32(14) ps							
1820(3)											
1837(6)	1^+	0	0.036		75Me17						
1846(3)											
1893.1(6)	5,7,9										
1896(6)	1^+	0	0.054		75Me17						
1959(3)											
1992(6)	$1^-, 3^-$	1	0.028		75Me17						
2003(3)											
2023(3)											
2156(6)	1^+	0+2	0.01+0.06		75Me17						
2156(6)	$3^+, 5^+$										
2204.2(4)	$\langle 5 \rangle^+$								13(1)		36(3)
2223(6)	1^+	0+2	0.05+0.31		75Me17						
2223(6)	$3^+, 5^+$										

(continued)

**⁸⁵Y
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E^*	$2J^\pi$	L	$(2J+1)C^2S$	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, d)	Γ_{cm}		$E^*_\text{f}:$ $2J^\pi_\text{f}:$	0.0 $\langle 1 \rangle^-$	19.8 9^+	266.3 5^-	416.4 $\langle 3 \rangle^-$	436.1 $\langle 5 \rangle^+$
2259.6(4)	$\langle 15^+, 17^+ \rangle$			3.0(3) ps							
2303.2(4)	$\langle 15 \rangle$			11.1(14) ps							
2350.2(5)	5,7,9										
2429.3(5)	5^+	2	0.050		75Me17						
2472(6)	1^+	0	0.050		75Me17						
2507.0(4)	$\langle 17^- \rangle$			11.1(7) ps							
2519(6)	$3^+, 5^+$	2	0.066		75Me17						
2551(6)	$3^+, 5^+$	2	0.10		75Me17						
2649.8(4)	$\langle 21^+ \rangle$			4.02(21) ps							
2745.7(4)	$\langle 17^-, 19^- \rangle$										
2748(6)	$3^+, 5^+$	2	0.22		75Me17						
2840(6)	$\langle 1^+ \rangle$	$\langle 0 \rangle$	0.04		75Me17						
2925.7(4)	$\langle 19^- \rangle$			5.1(10) ps							
2939(6)	$3^+, 5^+$	2	0.56		75Me17						
2990.4(4)	$\langle 19^+ \rangle$			1.7(3) ps							
3018.8(4)	$\langle 13 \rangle - \langle 23 \rangle$										
3041(6)	1^+	0	0.058		75Me17						
3110(6)	1^+	0	0.096		75Me17						
3168(6)	$\langle 1^+ \rangle$	$\langle 0 \rangle$	0.036		75Me17						
3230(6)	$3^+, 5^+$	2	0.16		75Me17						
3270(6)	$3^+, 5^+$	2	0.22		75Me17						
3304.4(4)	$\langle 21^- \rangle$			1.39(14) ps							
3375(6)	1^+	0	0.088								
3391.5(4)	$\langle 23^+ \rangle$			1.0(4) ps							
3672.4				2.4(7) ps							
4004.6(4)	$\langle 23^- \rangle$			<6 ps							
4079.6(4)	$\langle 15 \rangle - \langle 23 \rangle$										
4360.9(4)	$\langle 25^- \rangle$			1.66(14) ps							
4601.9(5)	$\langle 11 \rangle - \langle 27 \rangle$										
4913.3(4)	$\langle 29^+ \rangle$			0.69(14) ps							
4983.3(4)	$\langle 27 \rangle$										
5020.4(4)	$\langle 27^- \rangle$										
5436.5(4)	$\langle 29^- \rangle$										
8779(19)	5^+			28(8) keV							
8817(19)	1^+			22(5) keV							
9225(19)	$3^+, 5^+$			23(8) keV							
9287(19)	1^+			15(5) keV							
9756(19)	$3^+, 5^+$			32(10) keV							
9944(19)	1^+			19(5) keV							
9969(19)	$3^+, 5^+$			20(4) keV							
10038(19)	1^+			16(5) keV							
10186(19)	1^+			19(3) keV							
10507(19)	1^+			54(6) keV							
10624(19)											
10735(19)	1^+			25(5) keV							

(continued)

⁸⁵₃₉Y

E^*	$2J^\pi$	L	$(2J+1)C^2S$	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, d)	Γ_{cm}		E_f^* : $2J_f^\pi$:	0.0 $\langle 1 \rangle^-$	19.8 9^+	266.3 5^-	416.4 $\langle 3 \rangle^-$	436.1 $\langle 5 \rangle^+$
10899(19)	1 ⁺			30(6) keV							
11034(19)	1 ⁺			22(4) keV							
11088(19)	1 ⁺			25(5) keV							
			75Me17		Ref.						

Comparison of spectroscopic factors $G_{lj}=(2J+1)C^2S$ in ⁸⁵Y, ⁸⁷Y and ⁸⁹Y is given in [75Me17].

Energy levels and branching ratios [91Si01]. Part 2

⁸⁵₃₉Y

E^*	$2J^\pi$	E_f^* : $2J_f^\pi$:	474.0	636.7	793.9	814.8	1010.6	1179.6	1310.8	1393.3	1648.5	1797.6
[keV]				3 ⁻		$\langle 13^+ \rangle$		$\langle 11^+ \rangle$	5,7,9	5,7,9	$\langle 13^+ \rangle$	$\langle 17^+ \rangle$
1179.6(4)	$\langle 11^+ \rangle$		x			41(3)						
1218.2(4)	5,7,9		4.6(6)									
1274.1(5)	5,7,9		59(8)		18(8)							
1310.8(5)	5,7,9		45(9)									
1648.5(4)	$\langle 13^+ \rangle$					46(3)		36(4)				
1797.6(4)	$\langle 17^+ \rangle$					100						
1893.1(6)	5,7,9		100									
2204.2(4)	$\langle 5 \rangle^+$		14(2)	8(1)	21(2)					8(1)		
2259.6(4)	$\langle 15^+, 17^+ \rangle$					78(5)						22(4)
2303.2(4)	$\langle 15 \rangle$					39.6(12)					60.4(15)	
2350.2(5)	5,7,9		75(8)				25(8)					
2429.3(5)	5 ⁺		56(6)						44(6)			
2649.8(4)	$\langle 21^+ \rangle$											100
2925.7(4)	$\langle 19^- \rangle$											66(4)
2990.4(4)	$\langle 19^+ \rangle$											77(3)

Energy levels and branching ratios [91Si01]. Part 3

⁸⁵₃₉Y

E^*	$2J^\pi$	E_f^* : $2J_f^\pi$:	2303.2	2507.0	2649.8	2746	2925.7	2990	3304.4	3391.5	3672	4004.6
[keV]			$\langle 15 \rangle$	$\langle 17^- \rangle$	$\langle 21^+ \rangle$		$\langle 19^- \rangle$	$\langle 19^+ \rangle$	$\langle 21^- \rangle$	$\langle 23^+ \rangle$		$\langle 23^- \rangle$
2507.0(4)	$\langle 17^- \rangle$		100									
2745.7(4)	$\langle 17^-, 19^- \rangle$			100								
2925.7(4)	$\langle 19^- \rangle$				34(2)							
2990.4(4)	$\langle 19^+ \rangle$				23(5)							
3018.8(4)	$\langle 13 \rangle - \langle 23 \rangle$					100						
3304.4(4)	$\langle 21^- \rangle$			35(2)			65(2)					
3391.5(4)	$\langle 23^+ \rangle$				100							

(continued)

⁸⁵₃₉Y

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E^*_f : $2J^\pi_f$:	2303.2 $\langle 15 \rangle$	2507.0 $\langle 17^- \rangle$	2649.8 $\langle 21^+ \rangle$	2746	2925.7 $\langle 19^- \rangle$	2990 $\langle 19^+ \rangle$	3304.4 $\langle 21^- \rangle$	3391.5 $\langle 23^+ \rangle$	3672	4004.6 $\langle 23^- \rangle$
3672.4					65(2)						35(3)	
4004.6(4)	$\langle 23^- \rangle$						78(5)		22(5)			
4079.6(4)	$\langle 15 \rangle$ – $\langle 23 \rangle$							100				
4360.9(4)	$\langle 25^- \rangle$								78(3)			22(2)
4913.3(4)	$\langle 29^+ \rangle$										100	

Energy levels and branching ratios [91Si01]. Part 4

⁸⁵₃₉Y

E^*	$2J^\pi$	Branching ratios in percentage		
[keV]		$E_f^*:$ $2J_f^\pi:$	4080 $\langle 25^- \rangle$	4360.9 $\langle 27^- \rangle$
4601.9(5)	$\langle 11 \rangle - \langle 27 \rangle$		100	
4983.3(4)	$\langle 27 \rangle$			100
5020.4(4)	$\langle 27^- \rangle$			100
5436.5(4)	$\langle 29^- \rangle$			100

Energy levels and branching ratios [97Ki04, 01Si43].

⁸⁶₃₉Y

E^*	J^π	L	β_L	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, t)	Γ_{cm}		E_f^* : J_f^π :	0.0 4 ⁻	208 $\langle 5 \rangle^-$	218 $\langle 8^+ \rangle$	243 2 ⁻	272 1 ⁺
0.0	4 ⁻	5	0.014	14.74(2) h	83Fi04						
208.10(17)	$\langle 5 \rangle^-$	5	0.012		83Fi04		100				
218.30(20)	$\langle 8^+ \rangle$	8	0.016	48(1) m	83Fi04			100			
242.80(10)	2 ⁻	2	0.010	28.5(21) ns	83Fi04		100				
271.90(13)	1 ⁺		incl	<10 ns	83Fi04					100	
292(20)	$\langle 5^+, 6^+ \rangle$	6	0.019		83Fi04						
302.2(5)	$\langle 7^- \rangle$			125(6) ns				85	15.0(5)		
353(20)	$\langle 3^+, 4^+ \rangle$	4	0.18		83Fi04						
465(20)	$\langle \leq 2, 5^+, 6^+ \rangle$	6	0.008		83Fi04						
536(20)	$\langle 3^+, 4^+ \rangle$	4	0.017		83Fi04						
643(20)											
671(20)	$\langle 4^-, 5^- \rangle$	5	0.019		83Fi04						
741(20)	$\langle 4-7 \rangle$	5+7	0.01+0.01		83Fi04						
883.90(13)	1 ⁺	3	0.006		83Fi04					x	100
886.3(11)	$\langle 9^+ \rangle$	10							100		
978(20)	$\langle 1^+, 2^+ \rangle$	2	0.005		83Fi04						
1058(20)	$\langle 1^+, 2^+ \rangle$	2	0.008		83Fi04						
1078.9(5)									x		

(continued)

⁸⁶Y
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E^*	J^π	L	β_L	$T_{1/2}$ or	Ref.	E^*_f : J^π_f :	Branching ratios in percentage				
[keV]			(τ, t)	Γ_{cm}			0.0 4 ⁻	208 $\langle 5 \rangle^-$	218 $\langle 8^+ \rangle$	243 2 ⁻	272 1 ⁺
1156(20)	$\langle 4^-, 5^- \rangle$	5	0.012		83Fi04						
1221(20)	$\langle 4^-, 5^- \rangle$	5	0.015		83Fi04						
1277(20)											
1325.39(25)	$\langle 10^+ \rangle$			<0.5 ns					100		
1346(20)		4+7	0.01+0.01		83Fi04						
1393(20)											
1455(20)											
2258.4(11)											
2521.3(3)	$\langle 12^+ \rangle$			<0.5 ns							
3189.3(11)											
3877.3(15)	$\langle 14^+ \rangle$										
4191.5(15)	$\langle 15^+ \rangle$										
			83Fi04		Ref.						

Energy levels and branching ratios [97Ki04, 01Si43]. Part 2

⁸⁶Y
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E^*	J^π	Branching ratios in percentage				
[keV]		$E_f^*:$ $J_f^\pi:$	1325 $\langle 10^+ \rangle$	2521 $\langle 12^+ \rangle$	3189	3877.3 $\langle 14^+ \rangle$
2258.4(11)			x			
2521.3(3)	$\langle 12^+ \rangle$		100			
3189.3(11)				100		
3877.3(15)	$\langle 14^+ \rangle$				x	
4191.5(15)	$\langle 15^+ \rangle$					100

Energy levels and branching ratios [98Gu07, 02He09].

⁸⁷Y
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E^*	$2J^\pi$	$G_{\ell j}$	$C^2 S'$	L	$C^2 S'$	L	σ (p,t)	σ (p, α)	R	σ (p, α)	$T_{1/2}$ or	Ref.
[keV]		(α, p)	(τ, d)	(τ, d)	(d, n)	(p, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\times 10^3$	μb	Γ_{cm}	
0.0	1 ⁻	[1.15]	1.15	1	1.14	0	87.9	48	16	56.0	79.8(3) h	98Gu07
380.82(7)	9 ⁺	6.23	7.19	4	5.48			16	2.7	13.3	13.37(3) h	98Gu07
793.73(8)	5 ⁻	2.60	1.15	3	0.70	2	1.3	110	16	119	≤ 10 ns	98Gu07
982.89(10)	3 ⁻	0.72	0.54	1	0.43	2	8.4	120	27	144		76Ho11
1152.71(11)	5 ⁺	0.24	0.32					10	2.2	2.3		98Gu07
1182.00(9)	$\langle 3 \rangle^-$					2	16.5			2.9		98Gu07
1203.01(9)	$\langle 5 \rangle^-$					2	37.0	12	1.5	15.0		98Gu07
1321(8)												
1404.43(13)	13 ⁺							3		6.6	≤ 10 ns	98Gu07

(continued)

 $^{87}_{39}\text{Y}$

E^*	$2J^\pi$	$G_{\ell j}$	C^2S'	L	C^2S'	L	σ (p,t)	σ (p, α)	R	σ (p, α)	$T_{1/2}$ or	Ref.
[keV]		(α ,p)	(τ ,d)	(τ ,d)	(d,n)	(p,t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\times 10^3$	μb	Γ_{cm}	
1404.93(24)	$\langle 7^+, 9^+ \rangle$							incl			≤ 10 ns	
1504(8)												
1590.90(14)	11^+							4			≤ 10 ns	75Pe02
1608.31(12)	$\langle 7^+, 9^+ \rangle$	1.58	0.53									77Me16
1609(5)	$3^-, 5^-$					2	0.85			1.8		98Gu07
1623.50(21)	$\langle 5, 7 \rangle$									4.9		98Gu07
1629.94(13)	$\langle 1^-, 3^- \rangle$											
1641(5)	1^-					0	2.1					
1704.7(4)	$\langle 5^- \rangle$									1.1		98Gu07
1719(4)	$3^-, 5^-$					2	1.5					
1756.08(11)	$\langle 5, 7^- \rangle$									1.7		98Gu07
1768.2(5)	$\langle 9^- \rangle$											
1801.64(15)	$\langle 1^-, 5^- \rangle$							9	1.3	8.8		98Gu07
1814(5)	$3^-, 5^-$					2	3.1					
1847.1	1^-	0.24	0.07			0	3.0	10	2.2	4.0		98Gu07
1979.95(12)	$\langle 7, 9^- \rangle$					4	14.2	55	0.8	63.8		98Gu07
2008.8(3)	$\langle 7 \rangle$									20.6		98Gu07
2021(5)	$\langle 7^-, 9^- \rangle$					$\langle 4 \rangle$	1.3					
2038.03(11)	$\langle 15^+ \rangle$										≤ 10 ns	
2072.8(15)												
2073.29(23)	$\langle 3-7 \rangle$											
2083.0(4)	$\langle 3 \rangle^-$											
2095(5)	$3^-, 5^-$	0.26	0.09			2	1.5					77Me16
2112.2(4)	5^+									14.4		98Gu07
2122(5)	$5^+, 7^+$					3	4.3					
2154.60(18)	$\langle 9^- \rangle$							12	4			75Pe02
2158.9								incl		15.5		98Gu07
2165(5)	$\langle 7, 9^- \rangle$					4	19.5	incl				
2186.0(3)	7^-									25.3		98Gu07
2202(5)	$7^-, 9^-$					4	3.1					
2202.15(17)	$7^+, 9^+$	0.92	0.79									77Me16
2207.93(15)	$\langle 15^+, 17^+ \rangle$									13		98Gu07
2209(3)	3^-											
2210.6	$\langle 1 \rangle$											
2216(5)	$9^+, 11^+$					5	4.5					
2241.4(8)	$\langle 7, 9^- \rangle$											
2244.8(6)										2.9		98Gu07
2249(3)	9^-											
2256(5)	$3^-, 5^-$	0.02	0.14			2	3.9					77Me16
2276	$\langle 9^- \rangle$											
2276(21)	$\langle 7^+ \rangle$											
2277.53(17)	$\langle 7^- \rangle$							35	5.7	52		98Gu07
2292.3	$5^+, 7^+$					3	19.2	incl				
2302.59(15)	13^+							incl		14.6		98Gu07
2314(5)	$5^+, 7^+$					$\langle 3 \rangle$						

(continued)

 $^{87}_{39}\text{Y}$

E^*	$2J^\pi$	$G_{\ell j}$	C^2S'	L	C^2S'	L	σ (p,t)	σ (p, α)	R	σ (p, α)	$T_{1/2}$ or	Ref.
[keV]		(α ,p)	(τ ,d)	(τ ,d)	(d,n)	(p,t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\times 10^3$	μb	Γ_{cm}	
2344.84(20)												
2353.53(21)												
2365(3)	7^+											
2366.88(15)	15^-					8	4.1			7.5	≤ 10 ns	98Gu07
2400.0(3)												
2408.3(3)	3^+		0.03			$\langle 3 \rangle$	1.0			18.4		98Gu07
2428.05(15)	17^+										≤ 10 ns	
2446(2)	$\langle 5 \rangle^+$					3	5.1			10.7		98Gu07
2449(3)	9^-											
2479.05(15)	$\langle 13 \rangle^-$					6	3.1					
2507	$\langle 5^+ \rangle$											
2531(3)	11^-											
2552.8(12)	$\langle 9 \rangle^+$					5	4.9			19.0		98Gu07
2563.7(7)	$9, 11^+$					5	38.8	11	0.37	50.0		98Gu07
2579	$\langle 3^- \rangle$							incl				
2599(3)	$\langle 9^- \rangle$							incl		37.4		98Gu07
2602.3(11)	7^+					3	8.6					
2618	$\langle 3^- \rangle$											
2648.88(16)	$\langle 15^- \rangle$							9	0.13			75Pe02
2661(3)	7^+									8.9		98Gu07
2668	$\langle 5 \rangle$											
2676.02(15)	17^-					8	3.1			7.7	$0.25(10)$ ns	98Gu07
2682(3)	11^+											
2730(4)	$5^-, 7^-$		0.16									77Me16
2737(5)	$9^+, 11^+$					5	13.6					
2747(3)	3^+									31.1		98Gu07
2762	$\langle 3^- \rangle$											
2801(3)	3^+									12.7		98Gu07
2801(3)	11^+											
2808(5)	$9^+, 11^+$					5	6.0					
2808.4(8)	$\langle 13^- \rangle$											
2827.15(18)	21^+										$0.53(3)$ ns	
2828(5)	$\langle 3, 5 \rangle^-$					$\langle 2 \rangle$	6.2					
2831(3)	9^-									10.9		98Gu07
2871(5)	$11^-, 13^-$					6	2.3					
2901(5)	$3^-, 5^-$					2	4.4			25.5		98Gu07
2907(4)	$3^+, 5^+$		0.12									
2960(3)	$\langle 5^+ \rangle$							25	2.5			75Pe02
2961.43(18)	17^-					8	1.5					
2986.9(3)	$\langle 23^+ \rangle$										< 49 ps	
2995(2)	$\langle 5 \rangle^+$		0.11			3	11.9			39.1		98Gu07
2995.6(3)	$\langle 17 \rangle$											
2996.1(11)	$\langle 7-11 \rangle$											
3038(5)	$9^+, 11^+$					5	7.2					
3043(4)	$3^+, 5^+$		0.20									77Me16

(continued)

⁸⁷₃₉Y

E^*	$2J^\pi$	$G_{\ell j}$	C^2S'	L	C^2S'	L	σ (p,t)	σ (p, α)	R	σ (p, α)	$T_{1/2}$ or	Ref.
[keV]		(α ,p)	(τ ,d)	(τ ,d)	(d,n)	(p,t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\times 10^3$	μb	Γ_{cm}	
3057(5)	$\langle 5^+, 7^+ \rangle$					$\langle 3 \rangle$	8.8					
3090(4)	$3^+, 5^+$		0.25									77Me16
3093(5)	$9^+, 11^+$					5	2.9					
3094.4(4)	$\langle 25 \rangle$										<49 ps	
3120(3)	$5^+, 7^+$					3	5.7					
3120(10)	$\langle 13^- \rangle$							20	1.4			75Pe02
3181(5)	$\langle 13^+, 15^+ \rangle$					$\langle 7 \rangle$	5.1					
3195(4)	$\langle 1^+ \rangle$		0.04									77Me16
3245(5)	$9^+, 11^+$					5	4.8					
3262.6(13)	$9^+, 11^+$					5	4.7					
3308(6)	$3^+, 5^+$		0.11									77Me16
3351(2)	$3^+, 5^+$		0.15									77Me16
3402.4(3)	$\langle 19^- \rangle$											
3405.2(11)	$3^+, 5^+$		0.09					9				75Pe02
3446.5(3)	$\langle 15-19 \rangle^-$							incl				
3500	$\langle 11^+ \rangle$							27	1.1			75Pe02
3552.91(19)	23^+											
3595.2(4)	$\langle 21-25^+ \rangle$											
3595.3(5)	$\langle 25^+ \rangle$										0.5(2) ns	
3640(20)												
3730	$\langle 7^- \rangle$							20	6.0			75Pe02
3766.6(4)	$21^{\langle - \rangle}$											
3840	$\langle 11^- \rangle$							45	3.2			75Pe02
3908.8(4)	$\langle 23^- \rangle$											
4039.36(21)	25^+										0.17(4) ps	
4214.1(3)	$\langle 27 \rangle$											
4555.0(4)	$\langle 23^+ \rangle$											
4564.1(3)	$\langle 23^- \rangle$											
4609.62(19)	$\langle 25^+ \rangle$										0.12(4) ps	
5228.2(3)	$\langle 25^- \rangle$											
5288.44(21)	27^+										0.10(3) ps	
5319.6(4)	$25^{\langle - \rangle}$											
5495.2(4)	$\langle 25^+ \rangle$											
5759.55(2)	$27^{\langle - \rangle}$										>2.1 ps	
5827.0(3)	$\langle 27^+ \rangle$											
5934.46(2)	$29^{\langle - \rangle}$										1.8(4) ps	
6535.5(3)	$31^{\langle - \rangle}$										0.18(4) ps	
7016.6(3)	$33^{\langle - \rangle}$										0.11(3) ps	
10537(11)	5^+										23(1) keV	
10923(11)	1^+										40(2) keV	
11468(15)	3^+										21(2) keV	
11739(11)	1^+										33(2) keV	
11900(11)	1^+										34(2) keV	
11966(23)	$\langle 3 \rangle^+$										25(8) keV	
11966(23)	$\langle 5^+ \rangle$										25(8) keV	

(continued)

⁸⁷₃₉Y

E^*	$2J^\pi$	$G_{\ell j}$	C^2S'	L	C^2S'	L	σ (p,t)	σ (p, α)	R	σ (p, α)	$T_{1/2}$ or	Ref.
[keV]		(α ,p)	(τ ,d)	(τ ,d)	(d,n)	(p,t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\times 10^3$	μb	Γ_{cm}	
12371(11)	3 ⁺										24(1) keV	
12661(14)	1 ⁺										44(4) keV	
12968(15)	3 ⁺											
13076(15)	5 ⁺											
		77Me16			76Ho11	76Oe02	76Oe02	75Pe02		98Gu07		Ref.
			71Ma11						75Pe02			Ref.

Data from the (α ,p) reaction [77Me16] were used for obtaining $G_{\ell j} = ((2J+1)/(2I+1)) \cdot S_{\ell j}$ by the assumption that the reaction proceeds by triton cluster transfer with two neutrons coupled to 0⁺; the same proton configuration as in the (³He,d) work [71Ma11] was used [91Si02]; normalization constant N=1100 in the expression $d\sigma/d\Omega_{\text{exp}} = N G_{\ell j} d\sigma/d\Omega_{\text{DWBA}}/(2j+1)$ was used.

Cross section of the (p, α) reaction is given together with the ratio $R = \sigma_{\text{exp}}/\sigma_{\text{DWBA}}$ [75Pe02].

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

Energy levels and branching ratios [98Gu07, 02He09]. Part 2

⁸⁷₃₉Y

E^*	$2J^\pi$	Branching ratios in percentage									
		E_f^* :	0.0	380.8	793.7	982.9	1152.7	1182.0	1203.0	1404.4	1404.9
[keV]		$2J_f^\pi$:	1 ⁻	9 ⁺	5 ⁻	3 ⁻	5 ⁺	$\langle 3 \rangle^-$	$\langle 5 \rangle^-$	13 ⁺	$\langle 7^+, 9^+ \rangle$
380.82(7)	9 ⁺		100								
793.73(8)	5 ⁻		100								
982.89(10)	3 ⁻		100								
1152.71(11)	5 ⁺			100							
1182.00(9)	$\langle 3 \rangle^-$		100								
1203.01(9)	$\langle 5 \rangle^-$		91(2)		8.9(3)						
1404.43(13)	13 ⁺			100							
1404.93(24)	$\langle 7^+, 9^+ \rangle$			100							
1590.90(14)	11 ⁺			100							
1608.31(12)	$\langle 7^+, 9^+ \rangle$			100							
1623.50(21)	$\langle 5, 7 \rangle$				39	39		22			
1629.94(13)	$\langle 1^-, 3^- \rangle$				100						
1704.7(4)	$\langle 5^- \rangle$		35(6)		33			26(5)	6		
1756.08(11)	$\langle 5, 7^- \rangle$				48(1)			37(1)	15(1)		
1768.2(5)	$\langle 9^- \rangle$				100						
1801.64(15)	$\langle 1^- - 5^- \rangle$		69(3)			6		14(3)	11		
1847.1	1 ⁻					60		40			
1979.95(12)	$\langle 7, 9^- \rangle$				11(2)		8(1)		36(1)		45
2008.8(3)	$\langle 7 \rangle$				100						
2038.03(11)	$\langle 15^+ \rangle$			50(1)						50(1)	
2072.8(15)				100							
2073.29(23)	$\langle 3-7 \rangle$				68		32				
2083.0(4)	$\langle 3^- \rangle$		32			17	10	31	10		
2112.2(4)	5 ⁺						55	15			30

(continued)

 $^{87}_{39}\text{Y}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage									
		$E_f^*:$ $2J_f^\pi:$	0.0 1^-	380.8 9^+	793.7 5^-	982.9 3^-	1152.7 5^+	1182.0 $\langle 3 \rangle^-$	1203.0 $\langle 5 \rangle^-$	1404.4 13^+	1404.9 $\langle 7^+, 9^+ \rangle$
2154.60(18)	$\langle 9^- \rangle$			72(3)					28.0(9)		
2158.9			100								
2186.0(3)	7^-				100						
2202.15(17)	$7^+, 9^+$			14(1)	8(4)		16(8)				48(2)
2210.6	$\langle 1 \rangle$		68								
2241.4(8)	$\langle 7, 9^- \rangle$			20(10)							40(20)
2244.8(6)					15				48		
2277.53(17)	$\langle 7^- \rangle$			22(5)	43(6)				35(4)		
2292.3	$5^+, 7^+$						100				
2302.59(15)	13^+			x						x	
2344.84(20)				50(4)							50(6)
2353.53(21)					x					32	
2366.88(15)	15^-									100	
2400.0(3)				100							
2408.3(3)	3^+		100								
2428.05(15)	17^+									100	
2552.8(12)	$\langle 9 \rangle^+$			33(17)			67(17)				
2563.7(7)	$9, 11^+$			20(7)							53(7)
2602.3(11)	7^+			75(17)	25(8)						
2996.1(11)	$\langle 7-11 \rangle$			50(34)							
3262.6(13)	$9^+, 11^+$			50(38)							50(25)

Energy levels and branching ratios [98Gu07, 02He09]. Part 3

 $^{87}_{39}\text{Y}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage									
		$E_f^*:$ $2J_f^\pi:$	1590.9 11^+	1608.3 $\langle 7^+, 9^+ \rangle$	1623.5 $\langle 5, 7 \rangle$	1768.2 $\langle 9^- \rangle$	1802	2038 $\langle 15^+ \rangle$	2202 $7^+, 9^+$	2367 15^-	2428 17^+
2202.15(17)	$7^+, 9^+$		14(1)								
2207.93(15)	$\langle 15^+, 17^+ \rangle$							100			
2210.6	$\langle 1 \rangle$						32				
2241.4(8)	$\langle 7, 9^- \rangle$			40(20)							
2244.8(6)					37						
2302.59(15)	13^+	x									
2353.53(21)				68							
2479.05(15)	$\langle 13 \rangle^-$		79(4)					21(2)			
2563.7(7)	$9, 11^+$		27(7)								
2676.02(15)	17^-									83(10)	17(2)
2808.4(8)	$\langle 13^- \rangle$					100					
2827.15(18)	21^+										100
2986.9(3)	$\langle 23^+ \rangle$										26(2)
2996.1(11)	$\langle 7-11 \rangle$			50(16)							
3405.2(11)	$3^+, 5^+$								100		

Energy levels and branching ratios [98Gu07, 02He09]. Part 4

 $^{87}_{39}\text{Y}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage									
		E_f^* : $2J_f^\pi$:	2479 $\langle 13 \rangle^-$	2649 $\langle 15^- \rangle$	2676.0 17^-	2827.1 21^+	2961 17^-	2986.9 $\langle 23^+ \rangle$	3402.4 $\langle 19^- \rangle$	3446	3553 23^+
2648.88(16)	$\langle 15^- \rangle$		100								
2676.02(15)	17^-			x							
2961.43(18)	17^-			29(3)	71(4)						
2986.9(3)	$\langle 23^+ \rangle$					74(4)					
2995.6(3)	$\langle 17 \rangle$			100							
3094.4(4)	$\langle 25 \rangle$							100			
3402.4(3)	$\langle 19^- \rangle$				66(5)		34(3)				
3446.5(3)	$\langle 15-19 \rangle^-$				100						
3552.91(19)	23^+					100					
3595.2(4)	$\langle 21-25^+ \rangle$					100					
3595.3(5)	$\langle 25^+ \rangle$							100			
3766.6(4)	$21^{\langle - \rangle}$				40(5)				60(5)		
3908.8(4)	$\langle 23^- \rangle$								83(5)		
4039.36(21)	25^+										100
4555.0(4)	$\langle 23^+ \rangle$					38(12)		62(9)			
4564.1(3)	$\langle 23^- \rangle$								18(2)	58(4)	24(10)
4609.62(19)	$\langle 25^+ \rangle$					43(9)					52(13)
5228.2(3)	$\langle 25^- \rangle$										24(3)
5288.44(21)	27^+										16(2)
5495.2(4)	$\langle 25^+ \rangle$										55(5)

Energy levels and branching ratios [98Gu07, 02He09]. Part 5

 $^{87}_{39}\text{Y}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage									
		E_f^* : $2J_f^\pi$:	3766.6 $21^{\langle - \rangle}$	3908.8 $\langle 23^- \rangle$	4039.4 25^+	4555.0 $\langle 23^+ \rangle$	4564.1 $\langle 23^- \rangle$	4609.6 $\langle 25^+ \rangle$	5228 $\langle 25^- \rangle$	5288 27^+	5319.6 $25^{\langle - \rangle}$
3908.8(4)	$\langle 23^- \rangle$		17(5)								
4214.1(3)	$\langle 27 \rangle$				100						
4609.62(19)	$\langle 25^+ \rangle$				6(2)						
5228.2(3)	$\langle 25^- \rangle$			43(5)	33(5)						
5288.44(21)	27^+				8.9(14)			75(14)			
5319.6(4)	$25^{\langle - \rangle}$	100									
5495.2(4)	$\langle 25^+ \rangle$					45(5)					
5759.55(2)	$27^{\langle - \rangle}$				41(5)		43(3)		4(2)		6(2)
5827.0(3)	$\langle 27^+ \rangle$				29(5)			66(9)			
5934.46(2)	$29^{\langle - \rangle}$								16(2)	28(2)	7(1)

Energy levels and branching ratios [98Gu07, 02He09]. Part 6

⁸⁷Y
39

E^*	$2J^\pi$	E_f^* : $2J_f^\pi$:	5495.2 $\langle 25^+ \rangle$	5759.5 $27^{\langle - \rangle}$	5827.0 $\langle 27^+ \rangle$	5934.5 $29^{\langle - \rangle}$	6535.5 $31^{\langle - \rangle}$
[keV]							
5759.55(2)	$27^{\langle - \rangle}$		5.3(8)				
5827.0(3)	$\langle 27^+ \rangle$		4.5(11)				
5934.46(2)	$29^{\langle - \rangle}$			35(2)	13(1)		
6535.5(3)	$31^{\langle - \rangle}$					100	
7016.6(3)	$33^{\langle - \rangle}$						100

Energy levels and branching ratios [88Mu09, 05Mu20].

⁸⁸Y
39

E^*	J^π	L	C^2S	L	C^2S	$\sigma(\tau, d)$	L	C^2S	$\sigma(d, t)$	L	C^2S	$\sigma(\tau, \alpha)$	$\sigma(\tau, \alpha)$	L	ε	$\sigma(d, \alpha)$	Ref.
[keV]			(d, n)		(τ, d)	$\mu\text{b/sr}$		(p, d)	$\mu\text{b/sr}$		(d, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(d, α)	$\mu\text{b/sr}$	
0.0	4^-	1	0.58	1	0.82	380	4	5.2**	275	4	3.9*	3600	58	3	2.0	195	71Co20
231.93(3)	$\langle 5 \rangle^-$	1	0.49	1	0.83	510	4	6.9	300	4	5.0	4500	23	5	0.8	45	71Co20
392.86(9)	1^+						1	1.2	265	1	0.99	200	14	0+2	5.0	307	75Co11
674.55(4)	$\langle 8 \rangle^+$			4	1.18	140			<1		weak	weak	9				71Co20
706.72(13)	$\langle 2^- \rangle$					190	2	0.061	17	$\langle 3 \rangle$	0.10			1	2.0	$\langle 40 \rangle$	75Co11
707(3)	$1^+, 2^+$			4	1.04	incl	1	0.021	incl	$\langle 1 \rangle$	0.04			2	0.5	$\langle 98 \rangle$	71Co20
712(5)	$\langle 7 \rangle^+$					incl			incl			38	25				
715.16(13)	$\langle 6 \rangle^+$					incl			incl								
766.4(3)	$\langle 0 \rangle^+$						1	0.43	57	1	0.33	97	18			$\langle <6 \rangle$	75Co11
843.18(12)	$\langle 5 \rangle^+$			4	1.12	84			<1			10	27			$\langle 16 \rangle$	71Co20
984.83(13)	$\langle 4 \rangle^+$			4	1.06	67			<1		weak	weak	37			$\langle <3 \rangle$	71Co20
1088.2(1)	$X^{\langle - \rangle}$			$\langle 1 \rangle$		7			<1			34	8			$\langle 8 \rangle$	71Co20
1129.1(2)	$3^- - 5^-$			1	0.076	49	4	0.19	≤ 4	4	0.10	120	4			$\langle 5 \rangle$	71Co20
1215(3)									≈ 5		weak						73Da10
1221.3(1)	$\langle 0, 1 \rangle^+$			4	0.86	19	1	0.66	66	1	0.49	280	55			<10	71Co20
1234(2)						incl											
1262(2)														$\langle 3 \rangle$	2.0	$\langle 30 \rangle$	73Da10
1275.3(10)	$\langle 1, 2 \rangle^+$			4	1.15	80	1	1.1	106	1	1.0	380	74	2+0	0.9	$\langle 70 \rangle$	71Co20
1283.9(2)	$\langle 3-5 \rangle$					incl						incl	incl				
1315(4)						140			≤ 4		weak			5	0.7	174	73Da10
1320.1(1)	X^-			1	0.2	incl			≤ 4		weak	weak	3			incl	71Co20
1461.6(3)														$\langle 7 \rangle$	0.7	21	73Da10
1475(4)	$2^- - 4^-$					150			≤ 8		weak	20	14	3	0.5	50	73Da10
1477.2(1)	$\langle 9 \rangle^+$	4	0.58	4	1.0	incl						incl					76Ho11
1570.8(9)						15			88		weak			0+2	≈ 1	111	73Da10
1575.4(2)	$\langle 1, 2 \rangle^+$					incl	1	1.2	incl			660	28		incl		75Co11
1595.9(5)	$2^- - 4^-$			1		78			≤ 1		weak	weak	4	3	2.3	35	71Co20
1702.7(2)	$3^+, 4^+$					8	3	2.5	20	$\langle 3 \rangle$	1.8	920	14	4	1.2	64	75Co11
1734(3)	$X^{\langle - \rangle}$			$\langle 1 \rangle$		27			≤ 4		weak	weak	5			10	71Co20
1761.0(20)	$\langle 3-5 \rangle^-$					22			≈ 10		weak	23	7	5	2.0	30	73Da10
1832.0(20)	$2^- - 4^-$			1		81						43	≈ 7	3	1.0	122	71Co20

(continued)

⁸⁸₃₉Y

E^*	J^π	L	C^2S	L	C^2S	σ (τ ,d)	L	C^2S	σ (d,t)	L	C^2S	σ (τ , α)	σ (τ , α)	L	ε	σ (d, α)	Ref.
[keV]		(d,n)		(τ ,d)	μ b/sr		(p,d)	μ b/sr		(d,t)	μ b/sr	μ b/sr		(d, α)	μ b/sr		
1881(5)	$X^{\langle - \rangle}$			$\langle 1 \rangle$	43						53	2				71Co20	
1905(6)	X^-			1	81					weak	150	2			20	71Co20	
1950(3)	1^+-3^+			$\langle 4 \rangle$	0.39	17				weak	290	38		2	2.4	50	71Co20
1971(4)						12					incl	15				15	
2055(2)	1^+-3^+			4	0.37	16				weak	140	57				10	71Co20
2121(8)	4^--6^-															67	
2136(5)	$X^{\langle - \rangle}$			$\langle 1 \rangle$		30					67	10		$\langle 4 \rangle$	0.7	incl	71Co20
2210(5)	1^+-3^+										62	weak					
2252(5)						6					100	13					
2291(4)	$\langle 2^- \rangle$																05Mu20
2305(5)						30					72	16					
2312.5(2)	$\langle 9^+ \rangle$																
2367(10)																	
2444.1(1)	$\langle 10^+ \rangle$																
2529(6)																	
2584(12)																	
2722(9)	3^+-5^+																
2734(3)	$\langle 3^- \rangle$																05Mu20
2764(3)	$\langle 2^- \rangle$																05Mu20
2787(3)	$\langle 1^- \rangle$																05Mu20
2829(3)	$\langle 4^- \rangle$																05Mu20
2944(3)	$\langle 2^- \rangle$																05Mu20
2957(7)																	05Mu20
2997(3)	$\langle X^- \rangle$																05Mu20
3025(3)	$\langle X^- \rangle$																05Mu20
3051(3)	$\langle X^- \rangle$																05Mu20
3093(3)	$\langle 3^- \rangle$																05Mu20
3122(3)	$\langle 1^- \rangle$																05Mu20
3146(3)	$\langle X^- \rangle$																05Mu20
3207.0(3)	$\langle X^- \rangle$																05Mu20
3256.8(2)	$\langle 9^--11^+ \rangle$																
3262(5)																	
3320(5)																	
3366(5)																	
3628(5)																	
3652.4(1)	$\langle 11^- \rangle$																
3777(8)																	
3857(11)																	
3964.1(2)	$\langle 12^- \rangle$																
4028(8)																	
4087(8)	$\langle 0^--2^- \rangle$																
4148(5)																	
4177.9(2)	$\langle 13^- \rangle$																
4823.9	$\langle 14^- \rangle$																
5558(1)	$\langle 15^- \rangle$																

(continued)

⁸⁸Y₃₉

E^*	J^π	L	C^2S	L	C^2S	σ (τ, d)	L	C^2S	σ (d, t)	L	C^2S	σ (τ, α)	σ (τ, α)	L	ε	σ (d, α)	Ref.
[keV]			(d, n)		(τ, d)	$\mu\text{b/sr}$		(p, d)	$\mu\text{b/sr}$		(d, t)	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(d, α)	$\mu\text{b/sr}$	
7070	$\langle 0^+ \rangle$																
8880	$\langle 2^+ \rangle$																
10290	$\langle 2^+ \rangle$																
11418	$\langle 2^+ \rangle$																
11482																	
11630	$\langle 2^+ \rangle$																
11909	$\langle 4^+, 5^+ \rangle$																
12082																	
12446	$\langle 4^+ \rangle$																
12690	$\langle 4^+, 5^+ \rangle$																
						71Co20			73Da10		73Da10	71Co20			73Da10		Ref.
			76Ho11		71Co20			75Co11					71Co20			73Da10	Ref.

Additional data on this isotope can be found in [97Gu01, 68Fo09].

* Similar values S_N were obtained earlier from (τ, α) reaction in [69Ba21].** Similar values S_N were obtained in [73Ta07].The mechanism of $^{90}\text{Zr}(d, \alpha)^{88}\text{Y}$ reaction was studied in [87Ha25].The last column contains the enhancement factor ε defined by $\sigma_{exp}/\sigma_{DWBA}$ from [73Da10]. $T_{1/2}$ and uncertainties in E^* are given in Supplement.

Energy levels and branching ratios [88Mu09, 05Mu20]. Part 2

⁸⁸Y₃₉

E^*	J^π	C^2S	σ (τ, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		(d, t)	rel.	Γ_{cm}		E_f^* : 0.0	232	393	674	707	715	766	
						J_f^π : 4 ⁻	$\langle 5 \rangle^-$	1 ⁺	$\langle 8 \rangle^+$	$\langle 2^- \rangle$	$\langle 6 \rangle^+$	$\langle 0 \rangle^+$	
0.0	4 ⁻	4.0(3)	380	106.62(1) d	71Co20								
231.93(3)	$\langle 5 \rangle^-$	5.1(4)	585		71Co20	100							
392.86(9)	1 ⁺	1.04	90	0.300(3) ms	75Co11	100							
674.55(4)	$\langle 8 \rangle^+$		<2	13.9(2) ms	71Co20		100						
706.72(13)	$\langle 2^- \rangle$	0.04	6		75Co11	7(4)		93(6)					
707(3)	1 ⁺ , 2 ⁺				71Co20								
712(5)	$\langle 7 \rangle^+$												
715.16(13)	$\langle 6 \rangle^+$	$\langle 0.2 \rangle$					100						
766.4(3)	$\langle 0 \rangle^+$	0.31	25		75Co11			100					
843.18(12)	$\langle 5 \rangle^+$		<2		71Co20	23(2)	22.0(15)				55(3)		
984.83(13)	$\langle 4 \rangle^+$		<2		71Co20	60(4)							
1088.2(1)	X $\langle - \rangle$		<2		71Co20	100							
1129.1(2)	3 ⁻ -5 ⁻	0.1	8		71Co20		100						
1215(3)					73Da10								
1221.3(1)	$\langle 0, 1 \rangle^+$	0.5	85		71Co20			100					
1234(2)						100							
1262(2)					73Da10	100							
1275.3(10)	$\langle 1, 2 \rangle^+$	1.0	144		71Co20			23(8)				77(8)	

(continued)

⁸⁸₃₉Y

E^*	J^π	C^2S	$\sigma\ (\tau,\alpha)$	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		(d,t)	$rel.$	Γ_{cm}		E_f^* : J_f^π :	0.0 4 ⁻	232 5 ⁻	393 1 ⁺	674 8 ⁺	707 2 ⁻	715 6 ⁺	766 0 ⁺
1283.9(2)	3-5						21(5)						
1315(4)					73Da10								
1320.1(1)	X ⁻		<2		71Co20			100					
1461.6(3)			<2		73Da10			100					
1475(4)	2 ⁻ -4 ⁻		<2		73Da10								
1477.2(1)	9 ⁺		incl		76Ho11					100			
1570.8(9)			30		73Da10			29(14)					
1575.4(2)	1,2 ⁺	0.9	150		75Co11						100		
1595.9(5)	2 ⁻ -4 ⁻		≤2		71Co20		100						
1702.7(2)	3 ⁺ ,4 ⁺	1.8	110		75Co11								
1734(3)	X ⁽⁻⁾				71Co20								
1761.0(20)	3-5 ⁻		≈2		73Da10		100						
1832.0(20)	2 ⁻ -4 ⁻		<2		71Co20		100						
1881(5)	X ⁽⁻⁾		10		71Co20								
1905(6)	X ⁻		incl		71Co20								
1950(3)	1 ⁺ -3 ⁺		20		71Co20								
1971(4)													
2055(2)	1 ⁺ -3 ⁺		32		71Co20								
2121(8)	4 ⁻ -6 ⁻												
2136(5)	X ⁽⁻⁾				71Co20								
2210(5)	1 ⁺ -3 ⁺												
2252(5)													
2291(4)	2 ⁻				05Mu20								
2305(5)													
2312.5(2)	9 ⁺									100			
2367(10)													
2444.1(1)	10 ⁺			<2 ps						89(5)			
2529(6)													
2584(12)													
2722(9)	3 ⁺ -5 ⁺												
2734(3)	3 ⁻				05Mu20								
2764(3)	2 ⁻				05Mu20								
2787(3)	1 ⁻				05Mu20								
2829(3)	4 ⁻				05Mu20								
2944(3)	2 ⁻				05Mu20								
2957(7)					05Mu20								
2997(3)	X ⁻				05Mu20								
3025(3)	X ⁻				05Mu20								
3051(3)	X ⁻				05Mu20								
3093(3)	3 ⁻				05Mu20								
3122(3)	1 ⁻				05Mu20								
3146(3)	X ⁻				05Mu20								
3207.0(3)	X ⁻				05Mu20								
3256.8(2)	9 ⁻ -11 ⁺												
3262(5)													

(continued)

⁸⁸₃₉Y

E^* [keV]	J^π	C^2S (d,t)	σ (τ, α) <i>rel.</i>	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage							
						E_f^* : J_f^π :	0.0 4 ⁻	232 ⟨5⟩ ⁻	393 1 ⁺	674 ⟨8⟩ ⁺	707 ⟨2⟩ ⁻	715 ⟨6⟩ ⁺	766 ⟨0⟩ ⁺
3320(5)													
3366(5)													
3628(5)													
3652.4(1)	⟨11 ⁻ ⟩			<2 ps									
3777(8)													
3857(11)													
3964.1(2)	⟨12 ⁻ ⟩			<2 ps									
4028(8)													
4087(8)	⟨0 ⁻ -2 ⁻ ⟩												
4148(5)													
4177.9(2)	⟨13 ⁻ ⟩			2.5(3) ps									
4823.9	⟨14 ⁻ ⟩			<0.3 ps									
5558(1)	⟨15 ⁻ ⟩			0.10(5) ps									
7070	⟨0 ⁺ ⟩												
8880	⟨2 ⁺ ⟩												
10290	⟨2 ⁺ ⟩												
11418	⟨2 ⁺ ⟩			20 keV									
11482				20 keV									
11630	⟨2 ⁺ ⟩			35 keV									
11909	⟨4 ⁺ , 5 ⁺ ⟩			35 keV									
12082				30 keV									
12446	⟨4 ⁺ ⟩			70 keV									
12690	⟨4 ⁺ , 5 ⁺ ⟩			80 keV									
					Ref.								
		73Da10	73Da10		Ref.								

Energy levels and branching ratios [88Mu09, 05Mu20]. Part 3

⁸⁸₃₉Y

E^* [keV]	J^π	Branching ratios in percentage											
		E_f^* : J_f^π :	843 ⟨5⟩ ⁺	984.8 ⟨4⟩ ⁺	1221.3 ⟨0,1⟩ ⁺	1477.2 ⟨9⟩ ⁺	2312.5 ⟨9⟩ ⁺	2444.1 ⟨10⟩ ⁺	3256.8	3652.4 ⟨11⟩ ⁻	3964.1 ⟨12⟩ ⁻	4178 ⟨13⟩ ⁻	4823.9 ⟨14⟩ ⁻
984.83(13)	⟨4⟩ ⁺		40(2)										
1283.9(2)	⟨3-5⟩			79(5)									
1570.8(9)				71(14)									
1702.7(2)	3 ⁺ , 4 ⁺			100									
2444.1(1)	⟨10 ⁺ ⟩				11.2(10)								
3207.0(3)	⟨X ⁻ ⟩				100								
3256.8(2)	⟨9 ⁻ -11 ⁺ ⟩				70(9)	30(12)							
3652.4(1)	⟨11 ⁻ ⟩						78(3)	22(2)					
3964.1(2)	⟨12 ⁻ ⟩								100				
4177.9(2)	⟨13 ⁻ ⟩										100		

(continued)

⁸⁸Y₃₉

E^*	J^π	Branching ratios in percentage											
[keV]		E_f^* : J_f^π :	843 $\langle 5 \rangle^+$	984.8 $\langle 4 \rangle^+$	1221.3 $\langle 0,1 \rangle^+$	1477.2 $\langle 9 \rangle^+$	2312.5 $\langle 9^+ \rangle$	2444.1 $\langle 10^+ \rangle$	3256.8	3652.4 $\langle 11^- \rangle$	3964.1 $\langle 12^- \rangle$	4178 $\langle 13^- \rangle$	4823.9 $\langle 14^- \rangle$
4823.9	$\langle 14^- \rangle$											100	
5558(1)	$\langle 15^- \rangle$												100

Energy levels and branching ratios [89Si20, 98Si31].

⁸⁹Y₃₉

E^*	$2J^\pi$	L	S_N	L	C^2S'	C^2S'	C^2S	C^2S	L	C^2S	S_N	L	σ (p, α)	σ (p, α)	I_s	Ref.
[keV]			(d,n)		(τ ,d)	(τ ,d)	(n,d)	(d, τ)		(d, τ)	(e,e'p)		rel.	μ b/sr	[eVb]	
0.0	1^-	1	1.31	1	1.85	1.47	1.7(5)	1.91	1	1.8	0.72(7)	1	1.0	48		76Ho11
908.97(3)	9^+	4	6.45	4	7.40	5.87		1.10	4	1.25	0.54(5)	4	0.44	48		76Ho11
1507.4(1)	3^-	1	0.28	1	0.38	0.30	1.8(5)	4.25	1	3.9	1.86(14)	1	1.29	100	98(12)	76Ho11
1744.7(2)	5^-		0.37	3	0.79	0.63	0.8(4)	7.80	3	8.9	2.77(19)	3	0.50	55		80St28
2222.4(2)	5^+			$\langle 2 \rangle$										1.0		71Vo08
2529.8(2)	7^+													1.2		
2566.6(2)	11^+															
2622.1(3)	9^+		0.41	4	0.25									4.5		76Ho11
2687																
2871.7(4)	$\langle 7 \rangle^+$			4										3.5		71Vo08
2881.5(1)	$\langle 3 \rangle^-$			1										incl	31(4)	71Vo08
2893.0(2)	13^+															
3067.8(1)	3^-			1	0.02										12(2)	71Vo08
3107.3(2)	$\langle 5 \rangle^-$													1.3	5.8(9)	97Re13
3138.9(3)	$\langle 5 \rangle^-$												0.012		4.5(8)	75Pe02
3247.6(5)	$\langle 3,5 \rangle$															
3343.4(2)	13^-															
3360																
3396.1(3)	$\langle 1-5 \rangle$															
3410.7(4)	$\langle 5^+ \rangle$															
3445.3(3)	$\langle 1-5 \rangle$															
3451.3(6)	$\langle 7^+ \rangle$															
3480.3(5)	$\langle 1-5 \rangle$															
3503.6(4)	$\langle 7 \rangle$															
3515.9(3)	$\langle 3 \rangle^-$			1	0.07										2.5(20)	97Re13
3557.4(5)	$\langle 5^+, 7^- \rangle$															
3560	$\langle 1 \rangle$											0,1	0.10	5.0		75Pe02
3621.1(6)	$\langle 11 \rangle$															
3630.3(6)	$\langle 11 \rangle^+$															
3660.0(5)	$\langle 1-5 \rangle$															
3715.3(4)	5^+	2	0.40	2	0.84	0.67										76Ho11
3747.7(8)	$\langle 9 \rangle^+$															
3752.9(4)	$\langle 5^+ \rangle$															
3790														5.0		75Pe02

(continued)

⁸⁹₃₉Y

E^*	$2J^\pi$	L	S_N	L	C^2S'	C^2S'	C^2S	C^2S	L	C^2S	S_N	L	σ (p, α)	σ (p, α)	I_s	$B(E1)$	Ref.
[keV]			(d,n)		(τ ,d)	(τ ,d)	(n,d)	(d, τ)		(d, τ)	(e,e'p)		<i>rel.</i>	$\mu\text{b/sr}$	[eVb]		
3810																	
3848.3(4)	$\langle 3^-, 5^- \rangle$																
3862.4(5)	$\langle 3, 5 \rangle^-$																
3898.6(5)	$\langle 1-5 \rangle$																
3924(5)																	
3976.8(6)	$\langle 11 \rangle^+$																
3992.10(10)	3^-														28(4)		97Re13
4015.3(7)	1^+	0.01	0	0.036	0.03												76Ho11
4022.96(23)	$\langle 3 \rangle^-$									0.12(2)							
4069.9(8)	$\langle 1-5 \rangle$													5.0			75Pe02
4104.9(5)	$\langle 7^+ \rangle$																
4132.22(16)	15^-																
4171.31(10)	$3^-, 5^-$														24(3)		97Re13
4188.1(6)	5^+	2	0.15	2	0.27	0.22											76Ho11
4230.4(12)	$\langle 7 \rangle$																
4250(1)																	
4254.40(23)	$\langle 15^+ \rangle$																
4309.3(6)	$\langle 7 \rangle^-$																
4334.1(12)																	
4354.7(10)																	
4383(5)																	
4408.4(8)	$\langle 1-5 \rangle$																
4449.75(16)	17^-																
4457.6(7)	$7^-, 9^-$																
4460(20)	$\langle 1^+ \rangle$			0	0.018												71Vo08
4476.3(13)	$\langle 5^+ \rangle$			2	0.02												71Vo08
4489(5)																	
4508(5)																	
4529.3(16)	$5^+, 7^+$																
4537.5(20)	$3^-, 5^-$																
4555(5)	$7^-, 9^-$																
4588(5)	5^+	2	0.22	2	0.40	0.32						$\langle 2 \rangle$	0.006	10			76Ho11
4603(5)	$7^-, 9^-$																
4616.8(5)	$\langle 1-5 \rangle$														4(1)	0.22(4)*	97Re13
4636(5)																	
4654(5)																	
4682(5)																	
4737(5)	$3^-, 5^-$																
4770(5)																	
4785(5)																	
4817(5)																	
4825.38(17)	17^+																
4831(5)	$3^+, 5^+$			2	0.32												71Vo08
4838.59(17)	19^-																
4849(5)	$3^-, 5^-$																

(continued)

⁸⁹Y
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E^*	$2J^\pi$	L	S_N	L	C^2S'	C^2S'	C^2S	C^2S	L	C^2S	S_N	σ (p, α)	σ (p, α)	I_s	$B(E1)$	Ref.
[keV]			(d,n)		(τ ,d)	(τ ,d)	(n,d)	(d, τ)		(d, τ)	(e,e'p)	<i>rel.</i>	$\mu\text{b/sr}$	[eVb]		
4862(5)																
4888(5)													5.0			75Pe02
4907(5)																
4920.46(17)	$\langle 19^+ \rangle$															
4927(5)																
4954(5)																
4973(5)																
4991(1)	$\langle 1-5 \rangle$													4(1)	0.18(6)*	97Re13
5006(8)	$\langle 5 \rangle^-$								3	0.8	0.29(4)					80St28
5026(8)																
5046(8)																
5075(8)	$\langle 1^+ \rangle$	0	0.065	0	0.25	0.19										76Ho11
5083.7(6)	1^+													5(1)	0.26(6)	97Re13
5099(8)																
5115(8)																
5125(8)	$[3^-]$												35			75Pe02
5152.1(8)	$\langle 1-5 \rangle$													5(1)	0.22(5)*	97Re13
5167.00(20)	$3^+, 5^+$													36(5)	1.74(25)	97Re13
5183(8)	$3^+, 5^+$			2	0.04											71Vo08
5211(8)	$[3^-]$												15			75Pe02
5257(8)																
5263.88(20)	$\langle 21^+ \rangle$															
5275(8)	$\langle 1^+ \rangle$			0	0.05											71Vo08
5289(8)	$3^-, 5^-$															
5303(8)																
5309.83(20)	$\langle 21^- \rangle$															
5321(8)																
5343(8)	$\langle 1^+ \rangle$			0	0.08											71Vo08
5362(8)																
5382(8)	$\langle 1 \rangle$												12			75Pe02
5412.1(4)	$\langle 19^- \rangle$															
5418.68(20)	$3^+, 5^+$													16(2)	0.71(11)	97Re13
5430(8)	$\langle 3^+, 5^+ \rangle$			2	0.09											71Vo08
5455(8)																
5476(8)																
5506(8)																
5542(8)																
5562(8)																
5582(8)																
5592(8)																
5624.81(20)	$\langle 3^+, 5^+ \rangle$			$\langle 2 \rangle$									16	69(11)	3.24(52)	71Vo08
5631(8)																
5647(8)																
5652.7(5)	$\langle 1-5 \rangle$													8(2)	0.4(1)*	97Re13
5668(8)																

(continued)

⁸⁹Y
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E^*	$2J^\pi$	L	S_N	L	C^2S'	C^2S'	C^2S	C^2S	L	C^2S	S_N	σ (p, α)	σ (p, α)	I_s	$B(E1)$	Ref.
[keV]			(d,n)		(τ ,d)	(τ ,d)	(n,d)	(d, τ)		(d, τ)	(e,e'p)	<i>rel.</i>	μ b/sr	[eVb]		
5694													38			75Pe02
5725(8)				$\langle 2 \rangle$												71Vo08
5739(8)																
5753(8)																
5774(8)																
5792.7(5)	$\langle 1-5 \rangle$													15(3)	0.6(1)*	97Re13
5801(8)																
5820(8)																
5843(8)																
5853(8)																
5879.4(4)	$\langle 19^+ \rangle$															
5888(8)	$3^+, 5^+$	2	0.13	2	0.31											76Ho11
5909.8(2)	$\langle 1-5 \rangle$													88(15)	3.9(7)*	97Re13
5921.7(6)	$\langle 1-5 \rangle$													13(3)	0.5(1)*	97Re13
5950(8)																
5981(8)																
6004(8)																
6100(20)	$3^+, 5^+$			2	0.10											71Vo08
6121.5(2)	$\langle 1-5 \rangle$													81(14)	3.3(6)*	97Re13
6158.9(4)																
6198.90(21)	$\langle 23^+ \rangle$															
6200(20)	$7^+, 9^+$			4	0.82											71Vo08
6201.9(8)	$\langle 1-5 \rangle$													14(5)	0.6(2)*	97Re13
6206.8(5)	$\langle 1-5 \rangle$													23(6)	0.9(3)*	97Re13
6273.76(6)	$3^+, 5^+$			2	0.42									395(72)	15(3)	71Vo08
6296.1(2)	$3^+, 5^+$													56(11)	2.2(4)	97Re13
6300(20)	1^+	0	0.18													76Ho11
6329.9(2)	$\langle 1-5 \rangle$													47(9)	1.8(4)*	97Re13
6357.8(2)	$\langle 1-5 \rangle$													49(10)	1.9(3)*	97Re13
6396.1(2)	$\langle 1-5 \rangle$													73(14)	2.8(6)*	97Re13
6439.2(2)	$\langle 1-5 \rangle$													69(14)	2.9(8)*	97Re13
6472.8(11)	$1^+ - 5^+$			[2]	0.13									5.8(20)	0.22(8)	71Vo08
6491.1(10)	$1^+ - 5^+$													6.5(21)	0.25(8)	97Re13
6500(300)	$\langle 7^- \rangle$															
6529.4(3)	$\langle 1-5 \rangle$													46(10)	1.8(4)*	97Re13
6588.9(4)	$3^+, 5^+$			2	0.06									20(5)	0.74(18)	71Vo08
6605.0(8)	$3^+, 5^+$													7.4(23)	0.27(8)	97Re13
6674.4(3)	$\langle 23^+ \rangle$															
6680(20)																
6750																
6780(20)	7^-								3	2.1						80St28
6880																
7100																
7183.7(3)	$\langle 25^+ \rangle$															
7190																

(continued)

⁸⁹₃₉Y

E^*	$2J^\pi$	S_N	L	C^2S'	C^2S'	C^2S	C^2S	L	C^2S	S_N	σ (p, α)	σ (p, α)	I_s	Ref.
[keV]		(d,n)		(τ ,d)	(τ ,d)	(n,d)	(d, τ)		(d, τ)	(e,e'p)	<i>rel.</i>	μ b/sr	[eVb]	
7193.8(4)	$\langle 23^+ \rangle$													
7259.5(3)	$\langle 23^+ \rangle$													
7300(4000)														
7431.6(3)	$\langle 25^+ \rangle$													
7590.0(3)	$\langle 25^+ \rangle$													
7720(20)	$\langle 1^+ \rangle$		$\langle 0 \rangle$	0.155										71Vo08
7834.6(3)	$\langle 27^+ \rangle$													
8050														
8264.2(3)	$\langle 29^+ \rangle$													
8370														
8664(1)	$\langle 1-5 \rangle$													
8720.4(4)	$\langle 31^+ \rangle$													
10937(3)	$\langle 5^+ \rangle$													
12000(2)	$\langle 1^+, 3^+ \rangle$													
13800(200)														
14000(200)														
14700(300)														
15000(2)														
16790(40)														
17000(2)	$\langle 3^+, 5^+ \rangle$													
21500(200)														
28000(500)														
		76Ho11	71Vo08		76Ho11	87Bh08	68Pr02	80St28		75Pe02	75Pe02	97Re13	Ref.	Ref.
									88De43	98Si31				

Additional data on this isotope can be found in [92Fu04, 88De43, 82Me02, 80Br07, 80Sh21, 78Gu17, 77WiZV, 69Pi05].

Abundance: 100 %.

* $B(E1)$ in units $10^{-3}e^2fm^2$, for the levels with the unknown spin/parity B(M1) and B(E2) can be found in [97Re13].

** Values from [83Wa19] given in the review [87Bh08], see another set in [83Wa19].

The integrated scattering cross sections I_s and $B(E1)$ are from NRF experiment [97Re13].

For the (d,n), (τ ,d) and (d, τ) reactions spectroscopic factors $S_N=(2J+1)C^2S$ are obtained from DWBA analysis; comparison of C^2S for proton pickup reactions (n,d), (d, τ), (^6Li , ^7Be), (e,e'p) is given in [87Bh08]; data for proton-transfer reaction (τ ,d) in [72Ha24] are similar to that given here [71Vo08, 76Ho11].

Experimental cross sections σ (p, α) from [75Pe02] are normalized in [98Si31] to 1.0 for the ground state; cross section of the (p, α) reaction is given together with the ratio $R=\sigma_{exp}/\sigma_{DWBA}$ [75Pe02]; other results on ϵ values for the (p, α) reaction can be found in [78Gu17, 80Sh21, 80Br07].

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

Energy levels and branching ratios [89Si20, 98Si31]. Part 2

⁸⁹Y
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E^*	$2J^\pi$	C^2S	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		($^6\text{Li}, ^7\text{Be}$)	$\times 10^3$	Γ_{cm}		E_{f}^* : $2J_{\text{f}}^\pi$:	0.0 1 $^-$	909 9 $^+$	1507 3 $^-$	1745 5 $^-$	2222 5 $^+$	2530 7 $^+$	2567 11 $^+$
0.0	1 $^-$	1.1**	16	Stable	76Ho11								
908.97(3)	9 $^+$	0.6	7	15.663(5) s	76Ho11		100						
1507.4(1)	3 $^-$	2.1	22	23.9(+25-21) fs	76Ho11		100						
1744.7(2)	5 $^-$	5.2	8	0.64(6) ps	80St28		100						
2222.4(2)	5 $^+$			0.97(28) ps	71Vo08			69(1)	31(1)				
2529.8(2)	7 $^+$			0.08(4) ps				100					
2566.6(2)	11 $^+$			0.35(7) ps				100					
2622.1(3)	9 $^+$			0.21(10) ps	76Ho11			100					
2687													
2871.7(4)	$\langle 7 \rangle^+$			<0.2 ps	71Vo08			100					
2881.5(1)	$\langle 3 \rangle^-$			19.9(+21-19) fs	71Vo08		100						
2893.0(2)	13 $^+$			0.18(3) ps				99(3)					≈ 1.4
3067.8(1)	3 $^-$			45.0(11) fs	71Vo08		90(1)		9.6(7)				
3107.3(2)	$\langle 5 \rangle^-$		0.20	0.034(3) ps	97Re13		83(1)		8.4(8)	9.1(7)			
3138.9(3)	$\langle 5 \rangle^-$			0.11(3) ps	75Pe02		78(1)		13(1)		9(1)		
3247.6(5)	$\langle 3,5 \rangle$						7(1)		93(2)				
3343.4(2)	13 $^-$			0.42(14) ps									94(3)
3360													
3396.1(3)	$\langle 1-5 \rangle$						x						
3410.7(4)	$\langle 5^+ \rangle$							100					
3445.3(3)	$\langle 1-5 \rangle$						x						
3451.3(6)	$\langle 7^+ \rangle$							100					
3480.3(5)	$\langle 1-5 \rangle$						x						
3503.6(4)	$\langle 7 \rangle$								94(1)				
3515.9(3)	$\langle 3 \rangle^-$				97Re13		100			x			
3557.4(5)	$\langle 5^+, 7^- \rangle$							38(1)	50(1)	12(2)			
3560	$\langle 1 \rangle$		1.6		75Pe02								
3621.1(6)	$\langle 11 \rangle$							100					
3630.3(6)	$\langle 11 \rangle^+$							100					
3660.0(5)	$\langle 1-5 \rangle$						x						
3715.3(4)	5 $^+$				76Ho11			47(2)			38(2)		
3747.7(8)	$\langle 9 \rangle^+$							100					
3752.9(4)	$\langle 5^+ \rangle$							24(2)		68(2)			
3790					75Pe02								
3810													
3848.3(4)	$\langle 3^-, 5^- \rangle$								15(1)	85(1)			
3862.4(5)	$\langle 3,5 \rangle^-$						24(2)		76(2)				
3898.6(5)	$\langle 1-5 \rangle$						x						
3924(5)													
3976.8(6)	$\langle 11 \rangle^+$											100	
3992.10(10)	3 $^-$			9.3(10) fs	97Re13		100						
4015.3(7)	1 $^+$				76Ho11		57(4)				43(4)		
4022.96(23)	$\langle 3 \rangle^-$						12(1)		29(1)	22(1)	21(1)		
4069.9(8)	$\langle 1-5 \rangle$				75Pe02		x						
4104.9(5)	$\langle 7^+ \rangle$							26(2)			33(3)	42(3)	

(continued)

⁸⁹₃₉Y

E^*	$2J^\pi$	C^2S	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		(⁶ Li, ⁷ Be)	x10 ³	Γ_{cm}		E_f^* : $2J_f^\pi$:	0.0 1 ⁻	909 9 ⁺	1507 3 ⁻	1745 5 ⁻	2222 5 ⁺	2530 7 ⁺	2567 11 ⁺
4132.22(16)	15 ⁻			1.6(3) ps									
4171.31(10)	3 ⁻ , 5 ⁻			10.1(11) fs	97Re13		100						
4188.1(6)	5 ⁺				76Ho11			16(3)	84(2)				
4230.4(12)	$\langle 7 \rangle$							100					
4250(1)							x						
4254.40(23)	$\langle 15^+ \rangle$			1.4(7) ps									
4309.3(6)	$\langle 7 \rangle^-$							12(1)			88(1)		
4334.1(12)								100					
4354.7(10)								100					
4383(5)													
4408.4(8)	$\langle 1-5 \rangle$						60(5)		40(5)				
4449.75(16)	17 ⁻			4.5(10) ps									
4457.6(7)	7 ⁻ , 9 ⁻											100	
4460(20)	$\langle 1^+ \rangle$				71Vo08								
4476.3(13)	$\langle 5^+ \rangle$				71Vo08						100		
4489(5)													
4508(5)													
4529.3(16)	5 ⁺ , 7 ⁺							100					
4537.5(20)	3 ⁻ , 5 ⁻						100						
4555(5)	7 ⁻ , 9 ⁻												
4588(5)	5 ⁺		0.1		76Ho11								
4603(5)	7 ⁻ , 9 ⁻												
4616.8(5)	$\langle 1-5 \rangle$				97Re13		x						
4636(5)													
4654(5)													
4682(5)													
4737(5)	3 ⁻ , 5 ⁻												
4770(5)													
4785(5)													
4817(5)													
4825.38(17)	17 ⁺			≥ 3.5 ps									
4831(5)	3 ⁺ , 5 ⁺				71Vo08								
4838.59(17)	19 ⁻			21(8) ps									
4849(5)	3 ⁻ , 5 ⁻												
4862(5)													
4888(5)					75Pe02								
4907(5)													
4920.46(17)	$\langle 19^+ \rangle$			6.2(21) ps									
4927(5)													
4954(5)													
4973(5)													
4991(1)	$\langle 1-5 \rangle$				97Re13		x						
5006(8)	$\langle 5 \rangle^-$				80St28								
5026(8)													
5046(8)													

(continued)

⁸⁹Y
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E^*	$2J^\pi$	C^2S	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		($^6\text{Li}, ^7\text{Be}$)	$\times 10^3$	Γ_{cm}		$\frac{E^*_{\text{f}}}{2J^\pi_{\text{f}}}$:	0.0 1 $^-$	909 9 $^+$	1507 3 $^-$	1745 5 $^-$	2222 5 $^+$	2530 7 $^+$	2567 11 $^+$
5075(8)	$\langle 1^+ \rangle$				76Ho11								
5083.7(6)	1 $^+$				97Re13		x						
5099(8)													
5115(8)													
5125(8)	[3 $^-$]		8		75Pe02								
5152.1(8)	$\langle 1\text{--}5 \rangle$				97Re13		x						
5167.00(20)	3 $^+$, 5 $^+$				97Re13		96(20)		4.0(20)				
5183(8)	3 $^+$, 5 $^+$				71Vo08								
5211(8)	[3 $^-$]				75Pe02								
5257(8)													
5263.88(20)	$\langle 21^+ \rangle$			1.46(28) ps									
5275(8)	$\langle 1^+ \rangle$				71Vo08								
5289(8)	3 $^-$, 5 $^-$												
5303(8)													
5309.83(20)	$\langle 21^- \rangle$			4.5(9) ps									
5321(8)													
5343(8)	$\langle 1^+ \rangle$				71Vo08								
5362(8)													
5382(8)	$\langle 1 \rangle$		4		75Pe02								
5412.1(4)	$\langle 19^- \rangle$			1.25(28) ps									
5418.68(20)	3 $^+$, 5 $^+$				97Re13		x						
5430(8)	$\langle 3^+, 5^+ \rangle$				71Vo08								
5455(8)													
5476(8)													
5506(8)													
5542(8)													
5562(8)													
5582(8)													
5592(8)													
5624.81(20)	$\langle 3^+, 5^+ \rangle$				71Vo08		92.0(20)		8.0(20)				
5631(8)													
5647(8)													
5652.7(5)	$\langle 1\text{--}5 \rangle$				97Re13		x						
5668(8)													
5694					75Pe02								
5725(8)					71Vo08								
5739(8)													
5753(8)													
5774(8)													
5792.7(5)	$\langle 1\text{--}5 \rangle$				97Re13		x						
5801(8)													
5820(8)													
5843(8)													
5853(8)													
5879.4(4)	$\langle 19^+ \rangle$			0.14(10) ps									

(continued)

⁸⁹Y
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E^*	$2J^\pi$	C^2S	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		($^6\text{Li}, ^7\text{Be}$)	$\times 10^3$	Γ_{cm}		E^*_f : $2J^\pi_f$:	0.0 1 $^-$	909 9 $^+$	1507 3 $^-$	1745 5 $^-$	2222 5 $^+$	2530 7 $^+$	2567 11 $^+$
5888(8)	3 $^+$, 5 $^+$				76Ho11								
5909.8(2)	$\langle 1-5 \rangle$				97Re13		96(3)						
5921.7(6)	$\langle 1-5 \rangle$				97Re13		x						
5950(8)													
5981(8)													
6004(8)													
6100(20)	3 $^+$, 5 $^+$				71Vo08								
6121.5(2)	$\langle 1-5 \rangle$				97Re13		x						
6158.9(4)													
6198.90(21)	$\langle 23^+ \rangle$			0.19(4) ps									
6200(20)	7 $^+$, 9 $^+$				71Vo08								
6201.9(8)	$\langle 1-5 \rangle$				97Re13		x						
6206.8(5)	$\langle 1-5 \rangle$				97Re13		x						
6273.76(6)	3 $^+$, 5 $^+$				71Vo08		x						
6296.1(2)	3 $^+$, 5 $^+$				97Re13		x						
6300(20)	1 $^+$				76Ho11								
6329.9(2)	$\langle 1-5 \rangle$				97Re13		x						
6357.8(2)	$\langle 1-5 \rangle$				97Re13		x						
6396.1(2)	$\langle 1-5 \rangle$				97Re13		x						
6439.2(2)	$\langle 1-5 \rangle$				97Re13		91(7)						
6472.8(11)	1 $^+$ -5 $^+$				71Vo08		x						
6491.1(10)	1 $^+$ -5 $^+$				97Re13		x						
6500(300)	$\langle 7^- \rangle$												
6529.4(3)	$\langle 1-5 \rangle$				97Re13		x						
6588.9(4)	3 $^+$, 5 $^+$				71Vo08		x						
6605.0(8)	3 $^+$, 5 $^+$				97Re13		x						
6674.4(3)	$\langle 23^+ \rangle$			≤ 0.7 ps									
6680(20)													
6750				1.0(2) MeV									
6780(20)	7 $^-$				80St28								
6880													
7100													
7183.7(3)	$\langle 25^+ \rangle$			0.21(7) ps									
7190													
7193.8(4)	$\langle 23^+ \rangle$			0.35(14) ps									
7259.5(3)	$\langle 23^+ \rangle$												
7300(4000)													
7431.6(3)	$\langle 25^+ \rangle$			0.49(14) ps									
7590.0(3)	$\langle 25^+ \rangle$			0.35(14) ps									
7720(20)	$\langle 1^+ \rangle$				71Vo08								
7834.6(3)	$\langle 27^+ \rangle$			1.25(28) ps									
8050				1.2(2) MeV									
8264.2(3)	$\langle 29^+ \rangle$			0.97(21) ps									
8370													
8664(1)	$\langle 1-5 \rangle$						x						

(continued)

⁸⁹Y
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E^*	$2J^\pi$	C^2S	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		(⁶ Li, ⁷ Be)	x10 ³	Γ_{cm}		E_f^* : $2J_f^\pi$:	0.0 1 ⁻	909 9 ⁺	1507 3 ⁻	1745 5 ⁻	2222 5 ⁺	2530 7 ⁺	2567 11 ⁺
8720.4(4)	$\langle 31^+ \rangle$			0.48(14) ps									
10937(3)	$\langle 5^+ \rangle$						52(13)	6(2)	24(6)	18(5)			
12000(2)	$\langle 1^+, 3^+ \rangle$												
13800(200)				1.2(2) MeV									
14000(200)				4.5(4) MeV									
14700(300)				4.4(4) MeV									
15000(2)													
16790(40)				3.9(2) MeV									
17000(2)	$\langle 3^+, 5^+ \rangle$												
21500(200)				4.0(3) MeV									
28000(500)				8 MeV									
					Ref.								
		83Wa19			Ref.								

Energy levels and branching ratios [89Si20, 98Si31]. Part 3

⁸⁹Y
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E^*	$2J^\pi$	Branching ratios in percentage											
[keV]		E_f^* : $2J_f^\pi$:	2872 $\langle 7 \rangle^+$	2881.53 $\langle 3 \rangle^-$	2892.98 13 ⁺	3067.76 3 ⁻	3138.9 $\langle 5 \rangle^-$	3343.44 13 ⁻	3410.7 $\langle 5^+ \rangle$	3515.9 $\langle 3 \rangle^-$	4132.22 15 ⁻	4254.40 $\langle 15^+ \rangle$	
3343.4(2)	13 ⁻				5.8(6)								
3503.6(4)	$\langle 7 \rangle$						5.9(9)						
3715.3(4)	5 ⁺		14.7(11)										
3752.9(4)	$\langle 5^+ \rangle$								8.2(8)				
4022.96(23)	$\langle 3 \rangle^-$					16(1)							
4132.22(16)	15 ⁻				67(2)			33(2)					
4254.40(23)	$\langle 15^+ \rangle$				100								
4449.75(16)	17 ⁻							66.7(7)			33.3(13)		
4825.38(17)	17 ⁺				11(3)						80(6)	9(5)	
4838.59(17)	19 ⁻										34(6)		
5909.8(2)	$\langle 1-5 \rangle$			4(3)									
6439.2(2)	$\langle 1-5 \rangle$									9(7)			

Energy levels and branching ratios [89Si20, 98Si31]. Part 4

⁸⁹Y
39

E^*	$2J^\pi$	Branching ratios in percentage											
[keV]		E_f^* : $2J_f^\pi$:	4449.75 17 ⁻	4825.38 17 ⁺	4838.59 19 ⁻	4920.46 $\langle 19^+ \rangle$	5263.88 $\langle 21^+ \rangle$	6198.90 $\langle 23^+ \rangle$	6674.4 $\langle 23^+ \rangle$	7183.7 $\langle 25^+ \rangle$	7193.8 $\langle 23^+ \rangle$	7259.5 $\langle 23^+ \rangle$	
4838.59(17)	19 ⁻		66(1)										
4920.46(17)	$\langle 19^+ \rangle$		72(4)	28(2)									

(continued)

⁸⁹₃₉Y

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	4449.75 17 ⁻	4825.38 17 ⁺	4838.59 19 ⁻	4920.46 <19 ⁺ >	5263.88 <21 ⁺ >	6198.90 <23 ⁺ >	6674.4 <23 ⁺ >	7183.7 <25 ⁺ >	7193.8 <23 ⁺ >	7259.5 <23 ⁺ >
5263.88(20)	<21 ⁺ >				1.53(24)	98.5(18)						
5309.83(20)	<21 ⁻ >		5.0(6)		95(9)							
5412.1(4)	<19 ⁻ >		100									
5879.4(4)	<19 ⁺ >						100					
6158.9(4)							x					
6198.90(21)	<23 ⁺ >				x		100					
6674.4(3)	<23 ⁺ >						100					
7183.7(3)	<25 ⁺ >						74(16)	≈26				
7193.8(4)	<23 ⁺ >						≈47	53(12)				
7259.5(3)	<23 ⁺ >						100					
7431.6(3)	<25 ⁺ >							57(5)	≈24			19(2)
7590.0(3)	<25 ⁺ >										100	
7834.6(3)	<27 ⁺ >									26(3)		

Energy levels and branching ratios [89Si20, 98Si31]. Part 5

⁸⁹₃₉Y

E^* [keV]	$2J^\pi$	Branching ratios in percentage				
		E_f^* : $2J_f^\pi$:	7431.6 <25 ⁺ >	7590.0 <25 ⁺ >	7834.6 <27 ⁺ >	8264.2 <29 ⁺ >
7834.6(3)	<27 ⁺ >		≈59	15(2)		
8264.2(3)	<29 ⁺ >		<15		100	
8720.4(4)	<31 ⁺ >				<23	100

Energy levels and branching ratios [93Mi04, 97Br34].

⁹⁰₃₉Y

E^*	J^π	$d\sigma/d\Omega$	$G_{\ell j}$	ℓ	$2j_{\text{tr}}$	L	S'	S_n^+	L	C^2S	C^2S	C^2S	I_α	Ref.
[keV]		μb	(d,p)	(d,p)		(α, τ)	(α, τ)	(α, τ)		(d, τ)	(d, τ)	(t, α)	(d, α)	
0.0	2 ⁻	6300	2.25	2		2	2.66	1.06	1	0.48	0.86	0.40	35	93Mi04
202.501(14)	3 ⁻	8470	2.95	2		2	3.53	1.01	1	0.63	1.19	0.63	43	93Mi04
681.67(10)	7 ⁺								4	0.31		0.16	114	83De27
776.599(18)	2 ⁺								4	0.09		0.10		83De27
953.518(21)	2 ⁺ , 3 ⁺								4	0.09		0.10	14	83De27
1046.87(14)	5 ⁺ -7 ⁺								4	0.13		0.12	50	83De27
1189.69(8)														
1211.59(3)	0 ⁻	1670	0.54	0	1		0.58	1.16						93Mi04
1298.2(4)	<5-7> ⁺								4	0.11		0.12		83De27
1371.14(3)	1 ⁻	4750	1.55	0	1		1.46	0.97						93Mi04
1416.59(3)	3 ⁻	106	0.029	2	5				1	0.47	0.73		35	93Mi04

(continued)

⁹⁰Y
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E^*	J^π	$d\sigma/d\Omega$	$G_{\ell j}$	ℓ	$2j_{\text{tr}}$	L	S'	S_n^+	L	C^2S	C^2S	C^2S	I_α	Ref.
[keV]		μb	(d,p)	(d,p)		(α, τ)	(α, τ)	(α, τ)		(d, τ)	(d, τ)	(t, α)	(d, α)	
1561.9(5)	$3^-, 4^-$	29	0.11	4	7							1.20	447	93Mi04
1571.67(3)	2^-	162	0.045	2	5				1	0.90		incl	incl	93Mi04
1640.92(3)	1^-	152	0.016+	0	1+				1	0.21		1.94	149	93Mi04
			0.030	2	3									
1760.99(3)	2^-	416	0.11	2	3				1	0.12		0.83		93Mi04
1811.02(5)	3^-	860	0.23	2	5				1	0.22			64	93Mi04
1815.15(3)	1^+													
1962.1(2)	$5^+, 6^+$	145	1.18	5	11	5	1.55	0.27						93Mi04
2021.4(4)	12^*								3	1.07	2.71	1.28	128	74Gi09
2085.7(3)	$5^+, 6^+$	32**	0.22	5	11	5	0.26	0.045					incl	93Mi04
2133.51(6)*	$\langle 1, 2^- \rangle$													93Mi04
2179.4(7)	$\langle 2^-, 3^- \rangle$	32**	$\langle 0.011 \rangle$	$\langle 2 \rangle$	$\langle 5 \rangle$									93Mi04
2196.12(6)*	$\langle 1^-, 2 \rangle$	5**												93Mi04
2216.76(6)	8^+													02Ra13
2240.5(2)	$5^+, 6^+$	230	1.65	5	11	5	2.28							93Mi04
2244.31(6)	$\langle 1^+, 2^- \rangle$													
2313(10)	1^+													
2327.4(4)*		12												93Mi04
2365.98(6)	1^-	205	0.069	0	1									93Mi04
2455.26(7)	$\langle 9 \rangle^+$													
2475.94(7)	2^-	7760	1.92	2	3									93Mi04
2495.49(7)	$\langle 2, 1^- \rangle$													
2504.63(7)	2^-	470	0.12	2	3									93Mi04
2520.9(5)	$5^+, 6^+$	73	0.40	5	11	5	0.48							93Mi04
2558.4(3)	3^-	130	0.012+	2	5									93Mi04
			0.24	4	7									
2590.2(5)	$3^-, 4^-$	41	0.10	4	7									93Mi04
2624.01(9)	1^-	3980	0.98	2	3									93Mi04
2631.94(9)	$\langle 1^-, 3^- \rangle$													
2663.28(8)	$\langle 1, 2 \rangle^-$	21*												93Mi04
2678.1(4)	3^-	93	0.020	2	5									93Mi04
			0.025	4	7									
2702.6(5)		32		$\langle 2-4 \rangle$										93Mi04
2719.37(8)	$\langle 1^-, 2^- \rangle$													
2745.9(5)		210		$\langle 2+4 \rangle$										93Mi04
2749.25(7)	$\langle 1^-, 3^- \rangle$													
2755.4(3)	3^-	260	0.034	2	5									93Mi04
			0.250	4	7									
2758.08(7)	$\langle 1^-, 2^- \rangle$					$\langle 2 \rangle$	0.17							
2784.6(3)		92		$\langle 2-4 \rangle$										93Mi04
2819.7(3)	1^-	44	0.005	0	1									93Mi04
			0.008	2	3									
2838.32(8)	1,2					4	1.13							
2840(5)														
2847.42(9)	1^-	1170	0.19	0	1									93Mi04

(continued)

⁹⁰Y
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E^*	J^π	$d\sigma/d\Omega$	$G_{\ell j}$	ℓ	$2j_{\text{tr}}$	L	S'	S_n^+	L	C^2S	C^2S	C^2S	I_α	Ref.
[keV]		μb	(d,p)	(d,p)		(α, τ)	(α, τ)	(α, τ)		(d, τ)	(d, τ)	(t, α)	(d, α)	
2859.0	9 ⁺		0.19	2	3									02Ra13
2859.36(8)	2 ⁻	173	0.040	2	5									93Mi04
2870.4(2)	3 ⁻ , 4 ⁻	177	0.47	4	7									93Mi04
2905(15)														
2932.8(2)	3 ⁻ , 4 ⁻	830	2.12	4	7									93Mi04
2938														
2986.11(9)	$\langle 1^-, 2 \rangle$													
2992.36(9)	2 ⁻ , 1 ⁻	1490	0.35	2	3									93Mi04
3002.3(2)	3 ⁻	1090	2.61	4	7	2	0.72							93Mi04
3002.69(9)	$\langle 1^-, 2 \rangle$													72Go11
3043.49(8)	$\langle 2, 3^- \rangle$													
3048.2(2)	3 ⁻ , 4 ⁻	650	1.56	4	7									93Mi04
3097.55(12)	$\langle 10^+ \rangle$													02Ra13
3119.5(4)		20												93Mi04
3137.1(2)	3 ⁻ , 4 ⁻	290	0.61	4	7									93Mi04
3143.85(8)	$\langle 1^-, 3^- \rangle$													
3160.22(8)	1 ⁻	1370	0.11	0	1	$\langle 2 \rangle$	0.58							93Mi04
			0.24	2	3									
3203.9(4)	3 ⁻ , 4 ⁻	33	0.077	4	7									93Mi04
3270.0(4)		18												93Mi04
3309.5(3)	3 ⁻	40	0.005	2	5									93Mi04
			0.037	4	7									
3312.42(9)	$\langle 2, 1^- \rangle$													
3342.3(3)		100		$\langle 1, 5 \rangle$		$\langle 4 \rangle$	0.43							93Mi04
3354.3(3)		54		$\langle 2, 5 \rangle$										93Mi04
3404.87(11)	2 ⁻	91	0.022	2	5									93Mi04
3413.4(8)		37**												93Mi04
3438.8(8)	1 ⁺	49		$\langle 2-4 \rangle$										93Mi04
3469.1(1)	$\langle 2, 3^- \rangle$													
3476.06(9)	$\langle 1, 2^- \rangle$													
3490(5)	1 ⁺													
3496.8(4)	$\langle 3^- \rangle$	51		$\langle 2+4 \rangle$										93Mi04
3522.6(4)	5 ⁺ , 6 ⁺	98	0.33	5	11	5	0.66							93Mi04
3534.4(5)	$\langle 5^+, 6^+ \rangle$	42	$\langle 0.11 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04
3555.72(9)*	$\langle 1^-, 2 \rangle$	15**												93Mi04
3574.51(9)	1 ⁻	57	0.020+	0	1									93Mi04
			0.004	2	3									
3584.5(5)		143		$\langle 2-4 \rangle$										93Mi04
3592.9(6)	5 ⁺ , 6 ⁺	41	0.13	5	11									93Mi04
3602.1(1)	1 ⁻	75	0.014+	0	1									93Mi04
			0.09	2	3									
3625(6)	1 ⁺													
3627.7(1)	1 ⁻	52	0.015+	0	1	$\langle 4 \rangle$	1.12							93Mi04
			0.004	2	3									

(continued)

⁹⁰Y

E^*	J^π	$d\sigma/d\Omega$	$G_{\ell j}$	ℓ	$2j_{\text{tr}}$	L	S'	S_n^+	L	C^2S	C^2S	C^2S	I_α	Ref.
[keV]		μb	(d,p)	(d,p)		(α, τ)	(α, τ)	(α, τ)		(d, τ)	(d, τ)	(t, α)	(d, α)	
3644.2(5)	$5^+, 6^+$	110	0.32	5	11	$\langle 5 \rangle$	0.50							93Mi04
3667.3(8)		20												93Mi04
3685.23(10)	$\langle 1, 2^- \rangle$													
3692.32(10)	1^-	63	0.010+	0	1									93Mi04
			0.009	2	3									
3736.1(3)		22												93Mi04
3757.8(3)		39		$\langle 2-4 \rangle$										93Mi04
3792.1(3)	3^-	96**	0.017	2	5									93Mi04
3801.3(4)	$\langle 1^- \rangle$	57**	$\langle 0.016 \rangle$	$\langle 0+2 \rangle$	$\langle 1+3 \rangle$									93Mi04
3833.6(4)		11*	0.039	4	7									93Mi04
3858.7(3)	3^-	435	0.069+	2+4	5+7									93Mi04
			0.17											
3881.4(3)	3^-	222	0.025+	2+4	5+7									93Mi04
			0.15											
3907.2(4)	$\langle 1^- \rangle$	46**	$\langle 0.017 \rangle$	$\langle 0+2 \rangle$	$\langle 1+3 \rangle$									93Mi04
3934.48(11)	1^-	71	0.026	0	1									93Mi04
3942.5(2)*		8**												93Mi04
3953.55(11)	$\langle 1^-, 2^- \rangle$	46		$\langle \leq 2 \rangle$										93Mi04
3972.3(7)		84		$\langle 2-4 \rangle$										93Mi04
3980.4(3)	$\langle 3^- \rangle$	146	$\langle 0.08 \rangle$	$\langle 2+4 \rangle$	$\langle 5+7 \rangle$									93Mi04
4015.5(4)	$\langle 5^+, 6^+ \rangle$	32	$\langle 0.088 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04
4024.2(3)	$\langle 3^- \rangle$	77	$\langle 0.026 \rangle$	$\langle 2+4 \rangle$	$\langle 5+7 \rangle$									93Mi04
4037.56(11)	$\langle 1, 2^- \rangle$	40	$\langle 0.022 \rangle$	$\langle 2+4 \rangle$	$\langle 5+7 \rangle$									93Mi04
4038.0(3)	$\langle 3^- \rangle$													
4065.0(3)		315		$\langle 2, 5 \rangle$		5	0.84							93Mi04
4080.3(4)		42*												93Mi04
4100.52(12)	$\langle 1^-, 2^- \rangle$	21*												93Mi04
4127.5(3)	1^-	177	0.049+	0	1									93Mi04
			0.015	2	3									
4140.0(8)*		13**												93Mi04
4161.32(12)	$\langle 1, 2 \rangle$	21*												93Mi04
4166.8(3)		76		$\langle 2, 5 \rangle$										93Mi04
4197.7(3)	$\langle 2^-, 3^- \rangle$	37	$\langle 0.010 \rangle$	$\langle 2 \rangle$	$\langle 5 \rangle$									93Mi04
4210.82(11)	$\langle 1^-, 3^- \rangle$													
4212.73(13)	11^+													02Ra13
4219.7(3)	$\langle 2^- \rangle$	100	$\langle 0.024 \rangle$	2	$\langle 3+5 \rangle$									93Mi04
4267.38(11)	$\langle 1, 2 \rangle$													
4302.3(3)		61												93Mi04
4325.07(13)	$1^-, 2^-$	67	0.012	2	3									93Mi04
4341.2(3)	$5^+, 6^+$	114	0.25	5	11									93Mi04
4352.8(4)		22*												93Mi04
4377.9(3)	1^-	84	0.025+	0	1									93Mi04
			0.009	2	3									
4411.3(4)	$\langle 5^+, 6^+ \rangle$	18	$\langle 0.037 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04
4425.7(3)	$\langle 5^+, 6^+ \rangle$	19	$\langle 0.040 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04

(continued)

⁹⁰Y
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E^*	J^π	$d\sigma/d\Omega$	$G_{\ell j}$	ℓ	$2j_{\text{tr}}$	L	S'	S_n^+	L	C^2S	C^2S	C^2S	I_α	Ref.
[keV]		μb	(d,p)	(d,p)		(α, τ)	(α, τ)	(α, τ)		(d, τ)	(d, τ)	(t, α)	(d, α)	
4451.58(12)	$\langle 1, 2^- \rangle$													
4482.1(3)	$\langle 5^+, 6^+ \rangle$	44	$\langle 0.097 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04
4504.7(3)	$5^+, 6^+$	77	0.19	5	11									93Mi04
4515.95(12)	$\langle 1^-, 3^- \rangle$	59	0.010	2	3									93Mi04
4518.83(16)	12^+													02Ra13
4529.66(12)														
4533.14(12)	$2^-, \langle 1 \rangle^-$	80	0.013	2	3									93Mi04
4541.8	11^+													02Ra13
4548.0(4)		43												93Mi04
4558.5(5)	$\langle 0^-, 1^- \rangle$	51	$\langle 0.022 \rangle$	$\langle 0 \rangle$	$\langle 1 \rangle$									93Mi04
4572.0(4)	$2^-, 1^-$	67	$\langle 0.012 \rangle$	2	$\langle 3+5 \rangle$									93Mi04
4587.3(5)		19*												93Mi04
4619.5(5)		22*												93Mi04
4636.8(5)	$\langle 5^+, 6^+ \rangle$	52	$\langle 0.12 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04
4645.4(11)		11*												93Mi04
4656.1(7)	$\langle 5^+, 6^+ \rangle$	29	$\langle 0.07 \rangle$	$\langle 5 \rangle$	$\langle 11 \rangle$									93Mi04
4662.8(6)	3^-	91	0.015+	2	5									93Mi04
			0.043	4	7									
4672.6(7)	3^-	40**	0.006+	2	5									93Mi04
			0.020	4	7									
4685.8(7)	1^-	88	0.015+	2	1									93Mi04
			0.009	4	3									
4694.2(7)		38												93Mi04
4713.0(7)	$5^+, 6^+$	53	0.095	5	11									93Mi04
4725.4(18)														93Mi04
4735.2(8)		22*												93Mi04
4749.4(8)		54*		$\langle \leq 2 \rangle$										93Mi04
4777.1(10)		21*												93Mi04
4784.7(9)	$3^-, 4^-$	36	0.045	4	7									93Mi04
4802.9(10)		32*												93Mi04
4814.7(11)		17*												93Mi04
4822.7(11)		30*												93Mi04
4835.07(13)	$\langle 1, 2^- \rangle$	157		$\langle 2, 5 \rangle$										93Mi04
4865.9(12)	$5^+, 6^+$	32**	0.055	5	11									93Mi04
4881.4(12)		79		$\langle 2, 5 \rangle$										93Mi04
4895.4(13)	$2^-, 1^-$	50	0.011	2	$\langle 3+5 \rangle$									93Mi04
4914.8(13)	$1^-, 2^-$	90	$\langle 0.019 \rangle$	$\langle 2 \rangle$	$\langle 3 \rangle$									93Mi04
4927.3(15)		21*												93Mi04
4940.1(14)	$\langle 3^- \rangle$	106	$\langle 0.05 \rangle$	$\langle 2+4 \rangle$	$\langle 5+7 \rangle$									93Mi04
4953.2(15)	$\langle 1^- \rangle$	55	$\langle 0.022 \rangle$	$\langle 0+2 \rangle$	$\langle 1+3 \rangle$									93Mi04
4971.2(16)	$5^+, 6^+$	51	0.082	5	11									93Mi04
4986.0(16)	$\langle 0^-, 1^- \rangle$	38	$\langle 0.018 \rangle$	$\langle 0 \rangle$	$\langle 1 \rangle$									93Mi04
4997.9(25)	$2^-, 3^-$	44	0.009	2	5									93Mi04
5068.5														02Ra13
5102.8	12^-													02Ra13

(continued)

⁹⁰₃₉Y

E^*	J^π	$d\sigma/d\Omega$	$G_{\ell j}$	ℓ	$2j_{\text{tr}}$	L	S'	S_n^+	L	C^2S	C^2S	C^2S	I_α	Ref.
[keV]		μb	(d,p)	(d,p)		(α, τ)	(α, τ)	(α, τ)		(d, τ)	(d, τ)	(t, α)	(d, α)	
5111.4	13 ⁺													02Ra13
5359.6	14 ⁺													02Ra13
5525.6	12 ⁽⁺⁾													02Ra13
5541.5	12 ⁽⁺⁾													02Ra13
5674.6	12 ⁽⁺⁾													02Ra13
6065.5	13 ⁻													02Ra13
6234.9	13 ⁻													02Ra13
6822.7	13 ⁺													02Ra13
6831.2	13 ⁺													02Ra13
6898.4	15 ⁻													02Ra13
7355.7	14 ⁽⁺⁾													02Ra13
7882.9	15 ⁽⁺⁾													02Ra13
7994.3	16 ⁽⁻⁾													02Ra13
8421.6	16 ⁽⁺⁾													02Ra13
9006.1	17 ⁽⁺⁾													02Ra13
9317.4														02Ra13
9635.5	18 ⁺													02Ra13
		93Mi04	93Mi04	93Mi04	93Mi04	72Go11				80Ho05		83De27	74Gi09	Ref.
						72Go11				97Br34	74Co34			Ref.

Additional data on this isotope can be found in [02Ra13, 00PoZZ, 80Ho05, 77Fo12, 66Bl07, 74Co34, 64Wa14].

* Poor resolution or poor statistics in measurements [93Mi04]

** Measured at angles 15° or 25° instead of 10° or 20° [93Mi04]

For levels with $E^*=4515.9$ and 4518.8 keV spin 1⁻ or 2⁻ are given in [04Nu0A, 93Mi04].

Spectroscopic factors for neutron transfer of total and orbital angular momentum j_n and l_n in the (d,p) reaction are given by $G_{lj}=S(2J+1)/(2I_i+1)=d\sigma/d\Omega_{exp}/d\sigma/d\Omega_{DWBA}$ [93Mi04].

Comparison of several (d,p) and (α, τ) measurements is given in [72Go11] (see central columns).

Relative yield I_α of α -particles in the (d, α) reaction is in units counts per channel [74Gi09].

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

Energy levels and branching ratios [93Mi04, 97Br34]. Part 2

⁹⁰₃₉Y

E^*	J^π	$d\sigma/d\Omega$	S'	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		μb	(d,p)	Γ_{cm}		E_f^* :	0.0	202.5	682	777	953	1047	
						J_f^π :	2 ⁻	3 ⁻	7 ⁺	2 ⁺	2 ⁺ , 3 ⁺		
0.0	2 ⁻	5300	2.85	64.05(2) h	93Mi04								
202.501(14)	3 ⁻	6920	3.53	250(7) ps	93Mi04		100						
681.67(10)	7 ⁺			3.2(1) h	83De27		0.35(3)	100					
776.599(18)	2 ⁺				83De27		79(2)	21(4)					
953.518(21)	2 ⁺ , 3 ⁺				83De27		60(12)	4(1)		36(7)			
1046.87(14)	5 ⁺ -7 ⁺				83De27				100				
1189.69(8)											88(15)	12(6)	

(continued)

⁹⁰₃₉Y

E^*	J^π	$d\sigma/d\Omega$	S'	$T_{1/2}$ or	Ref.	Branching ratios in percentage						
[keV]		μb	(d,p)	Γ_{cm}		E_f^* : J_f^π :	0.0 2 ⁻	202.5 3 ⁻	682 7 ⁺	777 2 ⁺	953 2 ⁺ ,3 ⁺	1047
1211.59(3)	0 ⁻	690	0.58		93Mi04		100					
1298.2(4)	$\langle 5^-, 7^+ \rangle$				83De27				95(5)			4.8(22)
1371.14(3)	1 ⁻	2010	1.46		93Mi04		89(17)	11(3)				
1416.59(3)	3 ⁻	74			93Mi04		68(14)	32(7)				
1561.9(5)	3 ⁻ ,4 ⁻	36			93Mi04							
1571.67(3)	2 ⁻	119	0.11		93Mi04		55(11)	44(9)			1.0(3)	
1640.92(3)	1 ⁻	89	0.05		93Mi04		70(14)			16(3)		
1760.99(3)	2 ⁻	230	0.13		93Mi04		33(7)	67(13)				
1811.02(5)	3 ⁻	590	0.29		93Mi04		52(10)	48(13)				
1815.15(3)	1 ⁺						96(19)			2.7(9)		
1962.1(2)	5 ⁺ ,6 ⁺	184	1.39		93Mi04							35
2021.4(4)		18*			74Gi09							
2085.7(3)	5 ⁺ ,6 ⁺	33	0.23		93Mi04							
2133.51(6)*	$\langle 1, 2^- \rangle$	2**			93Mi04		9(1)			44(9)		
2179.4(7)	$\langle 2^-, 3^- \rangle$	22**			93Mi04							
2196.12(6)*	$\langle 1^-, 2 \rangle$				93Mi04		55(5)	10(2)		9(2)	19(4)	
2216.76(6)	8 ⁺				02Ra13				100			
2240.5(2)	5 ⁺ ,6 ⁺	277	1.52		93Mi04							44
2244.31(6)	$\langle 1^+, 2^- \rangle$						56(6)			27(6)	8(2)	
2313(10)	1 ⁺											
2327.4(4)*		5**			93Mi04							
2365.98(6)	1 ⁻	102	0.046		93Mi04		8.9(9)	6.1(7)				
2455.26(7)	$\langle 9 \rangle^+$											
2475.94(7)	2 ⁻	4310	1.94		93Mi04		15(2)	66(7)				
2495.49(7)	$\langle 2, 1^- \rangle$						29(3)	43(4)			10(4)	
2504.63(7)	2 ⁻	260	0.62		93Mi04		64(6)	14(1)			2.8(6)	
2520.9(5)	5 ⁺ ,6 ⁺	77			93Mi04							
2558.4(3)	3 ⁻	130			93Mi04							
2590.2(5)	3 ⁻ ,4 ⁻	37			93Mi04							
2624.01(9)	1 ⁻	2170	1.04		93Mi04		89(9)			4(1)		
2631.94(9)	$\langle 1^-, 3^- \rangle$							67(7)		13(3)		
2663.28(8)	$\langle 1, 2^- \rangle$	20*			93Mi04		69(7)	22(6)				
2678.1(4)	3 ⁻	69			93Mi04							
2702.6(5)		44			93Mi04							
2719.37(8)	$\langle 1^-, 2^- \rangle$						12(1)			47(9)		
2745.9(5)		227			93Mi04							100
2749.25(7)	$\langle 1^-, 3^- \rangle$						45(4)	40(4)		2.0(5)		
2755.4(3)	3 ⁻	190	0.11		93Mi04							
2758.08(7)	$\langle 1^-, 2^- \rangle$						27(3)	13(1)				
2784.6(3)		93			93Mi04							
2819.7(3)	1 ⁻	26			93Mi04							

(continued)

⁹⁰₃₉Y

E^* [keV]	J^π	$d\sigma/d\Omega$ μb	S' (d,p)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage						1047
						E_f^* : J_f^π :	0.0 2 ⁻	202.5 3 ⁻	682 7 ⁺	777 2 ⁺	953 2 ⁺ ,3 ⁺	
2838.32(8) 2840(5) 2847.42(9)	1,2 1 ⁻	650			93Mi04		40(4) 54(5)				32(6) 6(1)	
2859.0 2859.36(8) 2870.4(2) 2905(15) 2932.8(2) 2938	9 ⁺ 2 ⁻ 3 ⁻ ,4 ⁻ 3 ⁻ ,4 ⁻	109 214 950	0.23 incl		02Ra13 93Mi04 93Mi04 93Mi04		36(4)	41(4)			11(6)	
2986.11(9) 2992.36(9) 3002.3(2) 3002.69(9) 3043.49(8) 3048.2(2) 3097.55(12) 3119.5(4) 3137.1(2) 3143.85(8) 3160.22(8)	$\langle 1^-,2 \rangle$ 2 ⁻ ,1 ⁻ 3 ⁻ $\langle 1^-,2 \rangle$ $\langle 2,3^- \rangle$ 3 ⁻ ,4 ⁻ $\langle 10^+ \rangle$ 3 ⁻ ,4 ⁻ 3 ⁻ ,4 ⁻ $\langle 1^--3^- \rangle$ 1 ⁻	800 1130 720 21 280 710	0.43 1.52 0.6		93Mi04 93Mi04 72Go11 93Mi04 02Ra13 93Mi04 93Mi04 93Mi04	21(3) 4.0(5) 71(4) 29(2) 21(1) 100	13(2) 17(2)		29		34 26(3) 24(3) 8(3)	
3203.9(4) 3270.0(4) 3309.5(3)	3 ⁻ ,4 ⁻ 3 ⁻	37 20 31			93Mi04 93Mi04 93Mi04		2.4(7) 65(3)	24(2)			27(3)	
3312.42(9) 3342.3(3) 3354.3(3) 3404.87(11) 3413.4(8) 3438.8(8) 3469.1(1) 3476.06(9) 3490(5) 3496.8(4) 3522.6(4) 3534.4(5) 3555.72(9)* 3574.51(9)	$\langle 2,1^- \rangle$ 2 ⁻ 1 ⁺ $\langle 2,3^- \rangle$ $\langle 1,2^- \rangle$ 1 ⁺ $\langle 3^- \rangle$ 5 ⁺ ,6 ⁺ $\langle 5^+,6^+ \rangle$ $\langle 1^-,2 \rangle$ 1 ⁻	58 55 72 39 57 59 79 42 16 33	0.23 0.72		93Mi04 93Mi04 93Mi04 93Mi04 93Mi04 93Mi04 93Mi04 93Mi04 93Mi04	5.8(4) 21(3) 4.7(3) 13(1)	17(1)		12(2)		48(5)	
3584.5(5) 3592.9(6) 3602.1(1)	5 ⁺ ,6 ⁺ 1 ⁻	141 44 37	0.45		93Mi04 93Mi04 93Mi04		18(1) 5.9(3) 24(1)	2.5(2) 3.0(4) 9(1)		2.0(2)	12(1)	

(continued)

⁹⁰₃₉Y

E^*	J^π	$d\sigma/d\Omega$	S'	$T_{1/2}$ or	Ref.	Branching ratios in percentage						
[keV]		μb	(d,p)	Γ_{cm}		E_f^* : J_f^π :	0.0 2 ⁻	202.5 3 ⁻	682 7 ⁺	777 2 ⁺	953 2 ⁺ , 3 ⁺	1047
3625(6)	1 ⁺											
3627.7(1)	1 ⁻	22			93Mi04		7.3(4)					
3644.2(5)	5 ⁺ , 6 ⁺	96	0.37		93Mi04							
3667.3(8)		14			93Mi04							
3685.23(10)	$\langle 1, 2^- \rangle$									6(1)	2.7(7)	
3692.32(10)	1 ⁻	35			93Mi04		6.5(4)			37(4)		
3736.1(3)		24			93Mi04							
3757.8(3)		32			93Mi04							
3792.1(3)	3 ⁻	86			93Mi04							
3801.3(4)	$\langle 1^- \rangle$	33			93Mi04							
3833.6(4)		8*			93Mi04							
3858.7(3)	3 ⁻	320			93Mi04							
3881.4(3)	3 ⁻	171			93Mi04							
3907.2(4)	$\langle 1^- \rangle$	17**			93Mi04							
3934.48(11)	1 ⁻	17**			93Mi04		21(1)	10(1)				
3942.5(2)*		11**			93Mi04							
3953.55(11)	$\langle 1^-, 2^- \rangle$	6**			93Mi04		9.6(5)	3.8(3)				
3972.3(7)		58			93Mi04							
3980.4(3)	$\langle 3^- \rangle$	167			93Mi04							
4015.5(4)	$\langle 5^+, 6^+ \rangle$	26			93Mi04							
4024.2(3)	$\langle 3^- \rangle$	67			93Mi04							
4037.56(11)	$\langle 1, 2^- \rangle$	23			93Mi04					19(1)		
4038.0(3)	$\langle 3^- \rangle$											
4065.0(3)		256	0.73		93Mi04							
4080.3(4)		49*			93Mi04							
4100.52(12)	$\langle 1^-, 2^- \rangle$	6*			93Mi04					6(1)		
4127.5(3)	1 ⁻	85			93Mi04							
4140.0(8)*		14			93Mi04							
4161.32(12)	$\langle 1, 2 \rangle$	15*			93Mi04		35(2)					
4166.8(3)		47			93Mi04							
4197.7(3)	$\langle 2^-, 3^- \rangle$	37			93Mi04							
4210.82(11)	$\langle 1^-, 3^- \rangle$						21(1)					
4212.73(13)	11 ⁺				02Ra13							
4219.7(3)	$\langle 2^- \rangle$	81			93Mi04							
4267.38(11)	$\langle 1, 2 \rangle$						31(2)			3.1(3)		
4302.3(3)		43			93Mi04							
4325.07(13)	1 ⁻ , 2 ⁻	35			93Mi04			7.4(4)				
4341.2(3)	5 ⁺ , 6 ⁺	94			93Mi04							
4352.8(4)		9*			93Mi04							

(continued)

⁹⁰₃₉Y

E^*	J^π	$d\sigma/d\Omega$	S'	$T_{1/2}$ or	Ref.	Branching ratios in percentage						
[keV]		μb	(d,p)	Γ_{cm}		E_{f}^* : J_{f}^π :	0.0 2 [−]	202.5 3 [−]	682 7 ⁺	777 2 ⁺	953 2 ⁺ ,3 ⁺	1047
4377.9(3)	1 [−]	49			93Mi04							
4411.3(4)	$\langle 5^+,6^+ \rangle$	15			93Mi04							
4425.7(3)	$\langle 5^+,6^+ \rangle$	16			93Mi04							
4451.58(12)	$\langle 1,2^- \rangle$									4.7(3)	23(2)	
4482.1(3)	$\langle 5^+,6^+ \rangle$	42			93Mi04							
4504.7(3)	5 ⁺ ,6 ⁺	74			93Mi04							
4515.95(12)	$\langle 1^- - 3^- \rangle$	28			93Mi04			6.9(3)				
4518.83(16)	12 ⁺				02Ra13							
4529.66(12)							12(1)					
4533.14(12)	2 [−] , $\langle 1 \rangle^-$	41			93Mi04		38(2)				6.1(5)	
4541.8	11 ⁺				02Ra13							
4548.0(4)		44			93Mi04							
4558.5(5)	$\langle 0^-,1^- \rangle$	19			93Mi04							
4572.0(4)	2 [−] ,1 [−]	39			93Mi04							
4587.3(5)		13*			93Mi04							
4619.5(5)		12*			93Mi04							
4636.8(5)	$\langle 5^+,6^+ \rangle$	52			93Mi04							
4645.4(11)		9*			93Mi04							
4656.1(7)	$\langle 5^+,6^+ \rangle$	25			93Mi04							
4662.8(6)	3 [−]	88			93Mi04							
4672.6(7)	3 [−]	37			93Mi04							
4685.8(7)	1 [−]	39			93Mi04							
4694.2(7)		25			93Mi04							
4713.0(7)	5 ⁺ ,6 ⁺	40			93Mi04							
4725.4(18)		10*			93Mi04							
4735.2(8)		19*			93Mi04							
4749.4(8)		39*			93Mi04							
4777.1(10)		15*			93Mi04							
4784.7(9)	3 [−] ,4 [−]	35			93Mi04							
4802.9(10)		29*			93Mi04							
4814.7(11)		17*			93Mi04							
4822.7(11)		28*			93Mi04							
4835.07(13)	$\langle 1,2^- \rangle$	120			93Mi04		6(1)			10(1)	1(1)	
4865.9(12)	5 ⁺ ,6 ⁺	26			93Mi04							
4881.4(12)		57			93Mi04							
4895.4(13)	2 [−] ,1 [−]	35			93Mi04							
4914.8(13)	1 [−] ,2 [−]	70			93Mi04							
4927.3(15)		20*			93Mi04							
4940.1(14)	$\langle 3^- \rangle$	88			93Mi04							
4953.2(15)	$\langle 1^- \rangle$	38			93Mi04							
4971.2(16)	5 ⁺ ,6 ⁺	37			93Mi04							

(continued)

 $^{90}_{39}\text{Y}$

E^* [keV]	J^π	$d\sigma/d\Omega$ μb	S' (d,p)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage						
						E_f^* : J_f^π :	0.0 2 ⁻	202.5 3 ⁻	682 7 ⁺	777 2 ⁺	953 2 ⁺ , 3 ⁺	1047
4986.0(16)	$\langle 0^-, 1^- \rangle$	14			93Mi04							
4997.9(25)	2 ⁻ , 3 ⁻	35			93Mi04							
5068.5					02Ra13							
5102.8	12 ⁻				02Ra13							
5111.4	13 ⁺				02Ra13							
5359.6	14 ⁺				02Ra13							
5525.6	12 ⁽⁺⁾				02Ra13							
5541.5	12 ⁽⁺⁾				02Ra13							
5674.6	12 ⁽⁺⁾				02Ra13							
6065.5	13 ⁻				02Ra13							
6234.9	13 ⁻				02Ra13							
6822.7	13 ⁺				02Ra13							
6831.2	13 ⁺				02Ra13							
6898.4	15 ⁻				02Ra13							
7355.7	14 ⁽⁺⁾				02Ra13							
7882.9	15 ⁽⁺⁾				02Ra13							
7994.3	16 ⁽⁻⁾				02Ra13							
8421.6	16 ⁽⁺⁾				02Ra13							
9006.1	17 ⁽⁺⁾				02Ra13							
9317.4					02Ra13							
9635.5	18 ⁺				02Ra13							
		93Mi04			Ref.							
			72Go11		Ref.							

Energy levels and branching ratios [93Mi04, 97Br34]. Part 3

 $^{90}_{39}\text{Y}$

E^*	J^π	Branching ratios in percentage										
[keV]		E_f^* : J_f^π :	1189.7	1212	1298	1371.1	1416.6	1571.7	1640.9	1761.0	1811.0	1815.1
				0^-		1^-	$3^-, \langle 2 \rangle^-$	$2^-, \langle 3 \rangle^-$	1^-	$2^-, \langle 1 \rangle^-$	$3^-, \langle 2 \rangle^-$	1^+
1371.14(3)	1^-			0.5(3)								
1640.92(3)	1^-			10(2)		4.3(9)						
1815.15(3)	1^+			1.7(5)								
1962.1(2)	$5^+, 6^+$	35			30							
2085.7(3)	$5^+, 6^+$	44			56							
2133.51(6)*	$\langle 1, 2^- \rangle$			3.1(11)		40(8)	2.8(1)					
2196.12(6)*	$\langle 1^-, 2 \rangle$					2.3(5)						5(2)
2240.5(2)	$5^+, 6^+$				56							
2244.31(6)	$\langle 1^+, 2^- \rangle$			9(2)								
2365.98(6)	1^-					5.3(11)		28(6)	5.6(12)	46(9)		
2475.94(7)	2^-			7.1(15)		3.3(7)	3.3(8)	1.2(6)	2.8(8)	0.7(3)		
2495.49(7)	$\langle 2, 1^- \rangle$						8(2)	3(1)				6(1)
2504.63(7)	2^-			1.4(4)		2.7(6)	10(2)			0.8(3)	2.9(8)	2.5(5)

(continued)

⁹⁰₃₉Y

E^*	J^π	Branching ratios in percentage										
[keV]		$E_f^*:$ $J_f^\pi:$	1189.7	1212	1298	1371.1	1416.6	1571.7	1640.9	1761.0	1811.0	1815.1
				0^-		1^-	$3^-, \langle 2 \rangle^-$	$2^-, \langle 3 \rangle^-$	1^-	$2^-, \langle 1 \rangle^-$	$3^-, \langle 2 \rangle^-$	1^+
2624.01(9)	1^-									7.0(19)		
2631.94(9)	$\langle 1^-, 3^- \rangle$							9(3)		11(3)		
2663.28(8)	$\langle 1, 2 \rangle^-$			8(2)								
2719.37(8)	$\langle 1^-, 2^- \rangle$			25(9)		6(1)	6(1)					4(2)
2749.25(7)	$\langle 1^-, 3^- \rangle$					4.3(9)	5.5(11)	1.2(3)		0.9(2)	1.3(3)	
2758.08(7)	$\langle 1^-, 2^- \rangle$			17(3)		4(1)	2(1)	23(4)	4(1)	11(2)		
2838.32(8)	$1, 2$											26(5)
2847.42(9)	1^-			13(3)					22(7)	5(2)		
2859.36(8)	2^-			6(2)						7(2)		
2938							21			21	24	
2986.11(9)	$\langle 1^-, 2 \rangle$					8(2)			12(3)			7(2)
2992.36(9)	$2^-, 1^-$			66(13)						7.7(16)	2.2(7)	
3002.69(9)	$\langle 1^-, 2 \rangle$							9(2)				11(4)
3043.49(8)	$\langle 2, 3^- \rangle$						18(4)	11(2)	10(2)			
3143.85(8)	$\langle 1^-, 3^- \rangle$						46(10)					
3160.22(8)	1^-								17(3)	12(3)		
3312.42(9)	$\langle 2, 1^- \rangle$						53(10)		2.6(6)	7(2)		9(2)
3404.87(11)	2^-						34(7)					
3476.06(9)	$\langle 1, 2^- \rangle$			21(2)		27(3)			12(4)			
3555.72(9)*	$\langle 1^-, 2 \rangle$					16(2)	31(3)		8(2)	1.8(6)	1.8(4)	
3574.51(9)	1^-			39(4)				8.5(9)	16(3)			
3602.1(1)	1^-					11(1)		11(4)	3(1)		10(2)	
3627.7(1)	1^-			7(1)		28(3)			2(1)	2.6(6)		14(3)
3685.23(10)	$\langle 1, 2^- \rangle$			30(3)		2.9(7)	3.9(5)		3.9(7)			8(1)
3692.32(10)	1^-					34(3)						
3934.48(11)	1^-			17(2)		8(2)						
3953.55(11)	$\langle 1^-, 2^- \rangle$			3(1)				3(1)	9(1)		19(2)	
4037.56(11)	$\langle 1, 2^- \rangle$			17(2)				2.5(4)	12(1)			
4100.52(12)	$\langle 1^-, 2^- \rangle$			27(3)					9(3)			19(2)
4161.32(12)	$\langle 1, 2 \rangle$								18(2)			12(1)
4210.82(11)	$\langle 1^-, 3^- \rangle$							6(1)			20(2)	
4267.38(11)	$\langle 1, 2 \rangle$					2.0(3)						2.0(4)
4325.07(13)	$1^-, 2^-$											11(1)
4451.58(12)	$\langle 1, 2^- \rangle$			1.9(3)					6(1)	1.4(3)		16(2)
4515.95(12)	$\langle 1^-, 3^- \rangle$					21(2)		12(1)	24(2)			
4835.07(13)	$\langle 1, 2^- \rangle$			4.7(3)				6(1)	8(1)	3.4(3)		

Energy levels and branching ratios [93Mi04, 97Br34]. Part 4

⁹⁰Y
39

E^* [keV]	J^π	Branching ratios in percentage										
		E_f^* : J_f^π :	2133.5 $\langle 1, 2^- \rangle$	2196.1 $\langle 1^-, 2 \rangle$	2217 8^+	2244.3 $\langle 1^+, 2^- \rangle$	2365.98 1^-	2455.3 $\langle 9 \rangle^+$	2475.9 2^-	2495.5 $\langle 2, 1^- \rangle$	2505 2^-	2624.0 1^-
2455.26(7)	$\langle 9 \rangle^+$				100							
2838.32(8)	$1, 2$		2.7(9)									
2986.11(9)	$\langle 1^-, 2 \rangle$			13(3)								
2992.36(9)	$2^-, 1^-$					2.9(9)						
3002.69(9)	$\langle 1^-, 2 \rangle$					13(4)						
3097.55(12)	$\langle 10^+ \rangle$							100				
3160.22(8)	1^-					5.7(12)						
3312.42(9)	$\langle 2, 1^- \rangle$								2.5(9)			
3404.87(11)	2^-									17(4)		
3469.1(1)	$\langle 2, 3^- \rangle$											9(4)
3476.06(9)	$\langle 1, 2^- \rangle$									2.0(5)	4(1)	
3555.72(9)*	$\langle 1^-, 2 \rangle$		3.0(6)	11(2)			0.8(3)					
3574.51(9)	1^-		2.3(6)			1.6(5)					10(2)	
3602.1(1)	1^-											6(1)
3627.7(1)	1^-		2.2(6)			6(1)			6(1)	9(2)		
3685.23(10)	$\langle 1, 2^- \rangle$			7(1)		4(1)	5(1)					
3934.48(11)	1^-						25(5)			10(2)		
3953.55(11)	$\langle 1^-, 2^- \rangle$			13(3)			5(3)					4(1)
4037.56(11)	$\langle 1, 2^- \rangle$			2(1)			4(1)		9(2)		5(1)	
4100.52(12)	$\langle 1^-, 2^- \rangle$		7(2)						10(2)	9(2)		7(1)
4161.32(12)	$\langle 1, 2 \rangle$			15(6)			8(3)					
4210.82(11)	$\langle 1^-, 3^- \rangle$		15(2)			10(2)						5(2)
4267.38(11)	$\langle 1, 2 \rangle$									20(4)		11(2)
4325.07(13)	$1^-, 2^-$			8(2)						6(2)		
4451.58(12)	$\langle 1, 2^- \rangle$						2.9(6)					
4515.95(12)	$\langle 1^-, 3^- \rangle$		3(1)									
4529.66(12)						24(2)				12(2)		
4533.14(12)	$2^-, \langle 1 \rangle^-$		18(2)	6(1)					3.0(9)			
4835.07(13)	$\langle 1, 2^- \rangle$		16(2)				3(1)					

Energy levels and branching ratios [93Mi04, 97Br34]. Part 5

⁹⁰Y
39

E^* [keV]	J^π	Branching ratios in percentage										
		E_f^* : J_f^π :	2631.9	2663.3 $\langle 1, 2 \rangle^-$	2719.4 $\langle 1^-, 2^- \rangle$	2749.2	2758.1 $\langle 1^-, 2^- \rangle$	2838.3 $1, 2$	2847.4 1^-	2859.4 2^-	2986.1 $\langle 1^-, 2 \rangle$	2992.4 $2^-, 1^-$
3312.42(9)	$\langle 2, 1^- \rangle$			2.7(6)								
3469.1(1)	$\langle 2, 3^- \rangle$		7(2)		12(4)			6(2)				
3476.06(9)	$\langle 1, 2^- \rangle$		4(1)		10(2)			2.9(7)	2.2(7)			
3555.72(9)*	$\langle 1^-, 2 \rangle$		0.7(3)					0.5(2)		3.3(7)		
3574.51(9)	1^-		4(1)		1.7(5)		7(2)			0.8(3)		
3602.1(1)	1^-		4(2)		2(1)	0.004(2)	4(1)		3(1)	1.7(5)		
3627.7(1)	1^-			15(3)								

(continued)

⁹⁰₃₉Y

E^* [keV]	J^π	Branching ratios in percentage										
		$E_f^*:$ $J_f^\pi:$	2631.9 $\langle 1,2 \rangle^-$	2663.3 $\langle 1,2 \rangle^-$	2719.4 $\langle 1^-,2^- \rangle$	2749.2	2758.1 $\langle 1^-,2^- \rangle$	2838.3 1,2	2847.4 1^-	2859.4 2^-	2986.1 $\langle 1^-,2 \rangle$	2992.4 $2^-,1^-$
3685.23(10)	$\langle 1,2^- \rangle$				10(2)			4(2)			4(1)	8(3)
3692.32(10)	1^-									6(1)		
3934.48(11)	1^-										6(2)	
3953.55(11)	$\langle 1^-,2^- \rangle$	7(2)										
4037.56(11)	$\langle 1,2^- \rangle$					7(2)	12(3)		3(1)			
4161.32(12)	$\langle 1,2 \rangle$							4(1)		5(1)		
4210.82(11)	$\langle 1^--3^- \rangle$					4(1)						
4267.38(11)	$\langle 1,2 \rangle$							2.3(7)			10(2)	
4451.58(12)	$\langle 1,2^- \rangle$				13(3)							
4515.95(12)	$\langle 1^--3^- \rangle$				19(4)							
4529.66(12)								3(1)			25(6)	
4533.14(12)	$2^-, \langle 1 \rangle^-$			10(2)						11(2)		
4835.07(13)	$\langle 1,2^- \rangle$	17(2)										3(1)

Energy levels and branching ratios [93Mi04, 97Br34]. Part 6

⁹⁰₃₉Y

E^*	J^π	Branching ratios in percentage									
[keV]		$E_f^*:$ $J_f^\pi:$	3002.3 3^-	3002.7 $\langle 1^-,2 \rangle$	3043.5 $\langle 2,3^- \rangle$	3097 $\langle 10^+ \rangle$	3144	3160.2 1^-	3312.4 $\langle 2,1^- \rangle$	3404.9 $2^-, \langle 3^- \rangle$	3469.1 $\langle 2,3^- \rangle$
3692.32(10)	1^-			11(2)	5(1)						
3934.48(11)	1^-				3(1)						
3953.55(11)	$\langle 1^-,2^- \rangle$							23(5)			
4037.56(11)	$\langle 1,2^- \rangle$						7(2)				
4100.52(12)	$\langle 1^-,2^- \rangle$		3(1)								3(1)
4161.32(12)	$\langle 1,2 \rangle$			3(1)							
4210.82(11)	$\langle 1^--3^- \rangle$			11(2)				9(2)			
4212.73(13)	11^+					100					
4267.38(11)	$\langle 1,2 \rangle$							8(2)		3(1)	
4325.07(13)	$1^-,2^-$			12(3)	33(7)		6(2)				
4451.58(12)	$\langle 1,2^- \rangle$			17(3)							
4518.83(16)	12^+					60(5)					
4529.66(12)									11(2)	9(2)	4(2)
4533.14(12)	$2^-, \langle 1 \rangle^-$									3.2(9)	
4835.07(13)	$\langle 1,2^- \rangle$						3(1)			5(1)	

Energy levels and branching ratios [93Mi04, 97Br34]. Part 7

⁹⁰Y
39

E^*	J^π	Branching ratios in percentage								
[keV]		E^*_f : J^π_f :	3476.1 $\langle 1,2^- \rangle$	3555.7 $\langle 1^-,2 \rangle$	3574.5 1^-	3602.1 1^-	3692.3 1^-	3953.5 $\langle 1^-,2^- \rangle$	4161.3 $\langle 1,2 \rangle$	4212.7 $\langle 11^+ \rangle$
4267.38(11)	$\langle 1,2 \rangle$				7(2)					
4325.07(13)	$1^-,2^-$					16(3)				
4451.58(12)	$\langle 1,2^- \rangle$		2(1)	12(3)						
4515.95(12)	$\langle 1^--3^- \rangle$		11(2)	3(1)						
4518.83(16)	12^+									40(3)
4533.14(12)	$2^-, \langle 1 \rangle^-$					4(1)				
4835.07(13)	$\langle 1,2^- \rangle$						4(1)	4(2)	4(1)	

Energy levels and branching ratios [99Ba23].

⁹¹Y
39

E^* [keV]	$2J^\pi$	L	C^2S (d, τ)	L (t, p)	σ (t, p) $\mu\text{b/sr}$	σ (p, α) $\mu\text{b/sr}$	R x10 ³	$T_{1/2}$ or Γ_{cm}	Ref.
0	1^-	1	1.33	0	175	70	23	58.51(6) d	68Pr02
555.58(5)	9^+	4	1.09	4		27	4.1	49.71(4) m	68Pr02
653.02(7)	3^-	1	0.84	2	145	60	13		68Pr02
925.74(7)	5^-	3	1.50	2	215	26	3.6		68Pr02
1186.88(6)	$\langle 7 \rangle^-$			4	112	1	0.3		75Pr04
1305.39(6)	$\langle 5 \rangle^+$					1.2	0.12		75Pe02
1473.69(7)	3^-	1	1.90	2	54	48	11		68Pr02
1485.1	$\langle 13^+ \rangle$								05Bu08
1545.90(6)	$\langle 5 \rangle^-$	3	5.28	4	265	48	6.8		68Pr02
1547(10)	$7^-, 9^-$			incl	incl				75Pr04
1579.93(7)	$5^+, 7^+$					<8			75Pe02
1980.41(7)	$3^-, 5^-$	$\langle 1 \rangle$	0.21	2	125	2	0.3		68Pr02
2066.62(7)	$\langle 5 \rangle^+$			3	61				75Pr04
2129.1(1)	$3-7$								
2157.1	$\langle 17^+ \rangle$								05Bu08
2158(15)	$3^-, 5^-$			$\langle 2 \rangle$	10				75Pr04
2206.76(9)	5^-	3	1.21	2	245	11	1.5		68Pr02
2279.3(1)	$\langle 5^+, 7^- \rangle$								
2412.1(1)	$\langle 3^- \rangle$					12	2.8		75Pe02
2471(13)	3^-	1	0.38	$\langle 2 \rangle$	14				68Pr02
2530	$\langle 5^- \rangle$					7	0.9		75Pe02
2568(11)	1^-			0	14				75Pr04
2572.13(12)	$\langle 5^+, 7, 9^- \rangle$								
2631					5				
2689	$\langle 7^-, 9^- \rangle$			$\langle 4 \rangle$	17				75Pr04
2780	$\langle 9^+ \rangle$					24	3.9		75Pe02
2822(15)				$\langle 5 \rangle$	65				
2960	$\langle 3^- \rangle$				4	4	1.0		75Pe02
2980	$\langle 1^- \rangle$			$\langle 0 \rangle$	12				75Pr04

(continued)

⁹¹Y
₃₉

E^*	$2J^\pi$	L	C^2S	L	σ (t,p)	σ (p, α)	R	$T_{1/2}$ or	Ref.
[keV]			(d, τ)	(t,p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	$\times 10^3$	Γ_{cm}	
3045	1 ⁻			0	19				75Pr04
3100	$\langle 9^- \rangle$					9	0.13		75Pe02
3196	$\langle 7^-, 9, 11^+ \rangle$			$\langle 4, 5 \rangle$	35				75Pr04
3227	$\langle 9^+, 11^+ \rangle$			$\langle 5 \rangle$	27				75Pr04
3284	7 ⁻ , 9 ⁻			4	185				75Pr04
3320	11 ⁻ , 13 ⁻			6	8				75Pr04
3353	7 ⁻ , 9 ⁻			4	32				75Pr04
3414	7 ⁻ , 9 ⁻			4	175				75Pr04
3445	7 ⁻ , 9 ⁻			4	130				75Pr04
3502	5 ⁺ , 7, 9 ⁻			3, 4	85				75Pr04
3527.8	$\langle 21^+ \rangle$								05Bu08
3544	11 ⁻ , 13 ⁻			6	19				75Pr04
3611	$\langle 3^-, 5^- \rangle$			$\langle 2 \rangle$	68				75Pr04
3684	$\langle 3^-, 5, 7^+ \rangle$			$\langle 2, 3 \rangle$	32				75Pr04
3733.3									05Bu08
3751	5 ⁺ , 7, 9 ⁻			3, 4	35				75Pr04
3793	9 ⁺ , 11 ⁺			5	83				75Pr04
3839	9 ⁺ , 11 ⁺			5	89				75Pr04
3870	3 ⁻ , 5 ⁻			2	64				75Pr04
3938	$\langle 9^+, 11^+ \rangle$			$\langle 5 \rangle$	38				75Pr04
3966	$\langle 3^-, 5^- \rangle$			$\langle 2 \rangle$	18				75Pr04
4096	$\langle 3^-, 5^- \rangle$			$\langle 2 \rangle$	27				75Pr04
4147.0	$\langle 25^+ \rangle$								05Bu08
4225	$\langle 1^- \rangle$			$\langle 0 \rangle$	20				75Pr04
4451	$\langle 3^-, 5^- \rangle$			$\langle 2 \rangle$	26				75Pr04
4481.7									05Bu08
4809.1									05Bu08
			68Pr02		75Pr04	75Pe02	75Pe02		Ref.

Systematics of levels along the N=52 isotones and the interpretation of low-lying levels of ⁹¹Y as a $g_{9/2}$ proton hole weakly coupled to the 0⁺, 2⁺, 4⁺ and 6⁺ states of the even-even ⁹²Zr core can be found in [05Bu08].

Cross section of the (p, α) reaction is given together with the ratio $R=\sigma_{exp}/\sigma_{DWBA}$ [75Pe02].

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

Energy levels and branching ratios [99Ba23]. Part 2

⁹¹Y
₃₉

E^*	$2J^\pi$	Branching ratios in percentage									
[keV]		E_f^* : $2J_f^\pi$:	0	556	653	926	1187	1305	1474	1546	1579.93
			1 ⁻	9 ⁺	3 ⁻	5 ⁻	$\langle 7 \rangle^-$	$\langle 5 \rangle^+$	3 ⁻	$\langle 5 \rangle^-$	5 ⁺ , 7 ⁺
555.58(5)	9 ⁺		100								
653.02(7)	3 ⁻		100								
925.74(7)	5 ⁻		94(1)		6(1)						

(continued)

⁹¹Y

E^* [keV]	$2J^\pi$	Branching ratios in percentage									
		$E_f^*:$ $2J_f^\pi:$	0 1 ⁻	556 9 ⁺	653 3 ⁻	926 5 ⁻	1187 $\langle 7 \rangle^-$	1305 $\langle 5 \rangle^+$	1474 3 ⁻	1546 $\langle 5 \rangle^-$	1579.93 5 ⁺ , 7 ⁺
1186.88(6)	$\langle 7 \rangle^-$			51(1)	7.1(3)	42(1)					
1305.39(6)	$\langle 5 \rangle^+$		0.06(1)	88(1)	11(1)	0.55(1)	0.27(1)				
1473.69(7)	3 ⁻		51(1)		49(1)						
1545.90(6)	$\langle 5 \rangle^-$		3.4(2)		3.6(2)	90(2)	2.6(2)				
1579.93(7)	5 ⁺ , 7 ⁺			96		1.1(4)	0.14(1)	3.0(1)			
1980.41(7)	3 ⁻ , 5 ⁻				11(1)	60(1)	17(1)		12(1)		
2066.62(7)	$\langle 5 \rangle^+$				47(1)	6.1(1)	9.0(1)	28(1)	4.5(1)	1.6(1)	3.9(1)
2129.1(1)	3-7							100			
2206.76(9)	5 ⁻			20(1)	1.1(3)	63(1)		6.3(3)		6.8(3)	3.0(3)
2279.3(1)	$\langle 5^+, 7^- \rangle$			68(1)	6(1)	10(1)		17(1)			
2412.1(1)	$\langle 3^- \rangle$		25(6)			75(19)					
2572.13(12)	$\langle 5^+, 7, 9^- \rangle$			8(2)		6(1)					86(7)

Energy levels and branching ratios [00Bb11].

⁹²Y

E^*	J^π	L	σ (d, α)	R	σ (d, α)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(d, α)	μb	(d, α)	$\mu b/\text{sr}$	Γ_{cm}		E_{f}^* : J_{f}^π :	0.0 2 ⁻	241.6	430.5 $\langle 2 \rangle^-$	892.6 $\langle \leq 3 \rangle$
0.0	2 ⁻	3	137	100	15.7(10)	3.54(1) h	74Su06					
241.56(5)	$\langle 0^- - 3^+ \rangle$								100			
310(10)	2 ⁻ -4 ⁻	3	45	33	10.2(11)		74Su06					
430.51(3)	$\langle 2 \rangle^-$	3	50	36			74Su06		100			
780(10)	0 ⁻ -2 ⁻	1	107	78	19.6(14)		74Su06					
892.56(12)	$\langle \leq 3 \rangle$								18(3)	82(6)		
1030(10)	2 ⁻ -4 ⁻	3	78	57	13.3(11)		74Su06					
1310(10)	0 ⁻ -2 ⁻	1	65	47	9.5(10)		74Su06					
1383.90(4)	1 ⁺								93(3)	2.89(14)	3.64(15)	0.29(3)
1490(10)	1 ⁺ -3 ⁺	2	70	51	12.1(10)		74Su06					
1690(10)	3 ⁺ -5 ⁺	4	247	180	41.5(21)		74Su06					
1890(10)	$\langle 5^+ - 7^+ \rangle$	$\langle 6 \rangle$	115	84	19.9(12)		74Su06					
2070(100)	2 ⁻ -4 ⁻	3	131	96			74Su06					
2300(100)	4 ⁻ -6 ⁻	5	153	112			74Su06					
2440(10)	1 ⁺	0	144	105	10.2(10)		74Su06					
2900(100)	1 ⁺ -3 ⁺	2	166	121			74Su06					
			74Su06	74Su06	74Gi09		Ref.					

Cross sections are integrated from 21° to 101° (c.m.), the ratio $R = \sigma(\text{d}, \alpha)_{E^*} / \sigma(\text{d}, \alpha)_{g.s.}$ [74Su06]; cross sections in the second column are measured at 27°, data for 35° can be found in [74Gi09].

Energy levels and branching ratios [97Ba13].

⁹³Y

E^*	$2J^\pi$	L	C^2S	$2J^\pi$	σ (p, α)	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(d, τ)	(p, α)	$\mu\text{b/sr}$	$\times 10^3$	Γ_{cm}		E_{f}^* : $2J_{\text{f}}^\pi$:	0.0 1-	590 1-	759 7+	876 5-	1136 $\langle 3+,5- \rangle$
0.0	1-	1	1.58	1-	50	17	10.18(8) h	68Pr02						
590.219(21)	1-	1	0.89	3-	45	10	<0.13 ns	68Pr02	100					
758.719(21)	7+	4	0.81		6	1.0	0.82(4) s	68Pr02		100				
875.85(3)	5-	3	1.70	5-	40	6		68Pr02	99(6)	1.1(1)				
1135.99(4)	$\langle 3^+,5^- \rangle$			5-	30	4.3		75Pe02		4.2(3)	16(1)	80(5)		
1277.94(6)	$\langle 1^--5^- \rangle$	1	1.51	5-	40	5.8		68Pr02	56(4)	44(4)				
1300.52(3)	$\langle 3^+,5^- \rangle$	[3]	4.00	mult				68Pr02		96(5)	3.2(2)	1.1(2)		
1308.56(5)	$\langle 1^--5^- \rangle$								12(1)	44(6)		44(3)		
1542.73(10)	$\langle 1-5^- \rangle$				0.9			75Pe02	7(3)	19(4)				74(7)
1593.63(8)*														
1646.98(4)	3,5,7										83(4)	4.4(2)		
1695.91(9)	$\langle 1^--5^- \rangle$			$\langle 5+ \rangle$	19	1.9		75Pe02		42(8)				58(6)
1786.47(5)	$\langle 1^--5^- \rangle$								3.8(6)	47(3)		40(2)	9.2(10)	
1804.3(3)*														
1852.67(5)				$\langle 5- \rangle$	3.5	0.6		75Pe02			86(5)		14(8)	
1911.46(4)	$\langle 1^--5^- \rangle$									65(3)		5.1(8)		
2000					3			75Pe02						
2056.57(9)	$\langle 1^--5^- \rangle$									30(6)		70(8)		
2070	$\langle 11^- \rangle$			$\langle 11- \rangle$	5	0.4		75Pe02						
2091.35(5)											14(8)	72(4)		
2093.25(5)											22(2)			
2129.11(14)	$\langle 1^--5^- \rangle$								16(10)	16(3)				
≈ 2200														
2258.22(19)*														
2355.58(6)	$\langle 3,5^- \rangle$				8			75Pe02		65(3)				
2364.88(7)	$\langle 3,5^- \rangle$								75(4)	8(1)				
2543.93(7)	3-	1	0.51		42			68Pr02	73(4)			4(2)		
2569.95(5)	3+-7+											22(1)	7.8(5)	
2575.04(4)	$\langle 3^+ \rangle$								1.2(2)	0.7(1)	2.1(2)	30(2)	4.5(3)	
2653.91(11)	$\langle 1-5^- \rangle$									100				
2687.55(4)	3+-7+								12(1)		6.4(4)	7.7(5)	5.6(3)	
2769.99(5)	$\langle 3^+ \rangle$									3.8(5)		1.6(3)	18.9(10)	
2778.06(21)													26(9)	
2783.54(6)	3 ⁽⁺⁾ -7 ⁽⁺⁾				6			75Pe02				5.6(6)	28(2)	
2820.65(7)	$\langle 3^+ \rangle$									40(2)		14(1)	19(2)	
2886.52(9)	$\langle 3,5^- \rangle$				4.7			75Pe02		57(3)		9(1)		
2930(20)	1-,3-	1	0.66					68Pr02						
2981.60(24)*														
3007.05(9)	$\langle 3,5^- \rangle$								8.8(8)	8(2)				
3116.05(14)	$\langle 3,5^- \rangle$								18(2)					9(3)
3473.93(19)*														
3475.45(22)*														
3501.86(15)*														
3510.6(4)*														
3824.5(4)														

(continued)

⁹³Y

E^*	$2J^\pi$	L	C^2S	$2J^\pi$	σ (p, α)	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(d, τ)	(p, α)	$\mu\text{b/sr}$	$\times 10^3$	Γ_{cm}		E_f^* :	0.0	590	759	876	1136
									$2J_f^\pi$:	1-	1-	7+	5-	$\langle 3+, 5- \rangle$
3871.31(22)														11(2)
3883.53(12)*														
3894.9(3)														
20900(1000)							8.5(20) MeV							
		68Pr02		75Pe02	75Pe02			Ref.						

* Levels from [74Ac04] not included in the Adopted Levels Scheme [97Ba13].

Cross section of the (p, α) reaction is given together with the ratio $R=\sigma_{\text{exp}}/\sigma_{\text{DWBA}}$ [75Pe02].

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

Energy levels and branching ratios [97Ba13]. Part 2

⁹³Y

E^*	$2J^\pi$	Branching ratios in percentage											
[keV]	(p, α)	E_f^* :	1278	1300	1309	1542.7	1647.0	1786.5	1852.7	1911.5	2056.6	2091.3	
		$2J_f^\pi$:		$\langle 3+, 5- \rangle$			3,5,7						
1646.98(4)				12(1)									
1911.46(4)			2.7(5)	27(2)									
2091.35(5)				7.5(8)	6.3(8)								
2093.25(5)					2.4(7)		76(4)						
2129.11(14)						68(24)							
2355.58(6)			14(2)	21(2)									
2364.88(7)				18(1)									
2543.93(7)				20(1)							3(1)		
2569.95(5)				61(3)	0.7(3)		2.9(2)			3.6(4)			
2575.04(4)					10.0(7)	1.1(3)	2.8(4)	6.9(4)		15(1)	1.2(2)	15(1)	
2687.55(4)				19(1)	1.9(2)		17(1)	3.8(2)	9.1(5)	1.4(2)	1.1(2)	7(1)	
2769.99(5)			7.2(4)	6.8(4)			52(3)			9.5(6)			
2778.06(21)								74(12)					
2783.54(6)				3.2(6)			6.3(6)		13(1)			7(2)	
2820.65(7)				8(2)	1.4(4)						0.8(3)		
2886.52(9)							10(2)					18(2)	
3007.05(9)				83(5)									
3116.05(14)								18(3)					
3824.5(4)									17(6)				
3894.9(3)					11(3)			37(7)					

Energy levels and branching ratios [97Ba13]. Part 3

⁹³Y

E^* [keV]	$2J^\pi$ (p, α)	$E_f^*:$ $2J_f^\pi:$	Branching ratios in percentage									
			2093.2	2129.1	2355.6 $\langle 3,5^- \rangle$	2364.9 $\langle 3,5^- \rangle$	2543.9 3-	2569.9	2575.0 $\langle 3+ \rangle$	2653.9	2778.1	2820.6 $\langle 3+ \rangle$
2569.95(5)				1.7(4)								
2575.04(4)			10(1)									
2687.55(4)			6(1)		1.9(2)							
2783.54(6)			32(3)		5(1)							
2820.65(7)										16(4)		
2886.52(9)							6(2)					
3116.05(14)							55(7)					
3824.5(4)									36(14)		47(14)	
3871.31(22)				46(8)		25(8)						18(7)
3894.9(3)								23(9)			29(11)	

Energy levels and branching ratios [92Tu02, 06Ab37].

⁹⁴Y

E^* [keV]	J^π	L (d, α)	σ (d, α) μb	R (d, α)	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage					
							$E_f^*:$ $J_f^\pi:$	0 2-	622	724 $\langle 1^- \rangle$	907 $\langle 2^-, 3^- \rangle$	1428 1+
0	2-	3	378	100	18.7(1) m	74Su06						
432.2(10)	$\langle 3^- \rangle$	2	160	42		92Tu02						
621.70(7)								100				
723.80(7)	$\langle 1^- \rangle$							100	0.27(8)			
906.91(8)	$\langle 2^-, 3^- \rangle$							100				
1170(10)	$\langle 2^- \rangle$	4	518	137		74Su06						
1202.4	5+				1.35 μs	99Ge01						
1390(10)	$\langle 2^- - 4^- \rangle$	3	150	40		74Su06						
1427.71(7)	1+							95.9	1.78(12)	2.17(12)	0.15(4)	
1437.01(13)	0,1										100	
1530(10)		5	164	43		74Su06						
1820(10)		0	211	56		74Su06						
1900(20)												
2182.42(13)	1+							76(13)	8(2)			16(7)
2330(20)												
2373.02(16)	$\langle 0^-, 1 \rangle$								44(13)	56(17)		
2460(20)												
2770(30)												
2969.93(22)	1+									53(17)	47(17)	
3000*												
3300*												
4000*												
4100*												
4500*												
4900*												

(continued)

⁹⁴Y

E^*	J^π	L	σ (d, α)	R	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]		(d, α)	μb	(d, α)	Γ_{cm}		E_{f}^* : J_{f}^π :	0 2 ⁻	622	724 $\langle 1^- \rangle$	907 $\langle 2^-, 3^- \rangle$	1428 1 ⁺
5900*			74Su06	74Su06		Ref.						

Additional data on this isotope can be found in [74Gi09].

* from (d, α) reaction [06Ab37, 74Gi09, 74Su06].Cross sections are integrated from 21° to 101° (c.m.), the ratio $R = \sigma(\text{d}, \alpha)_{E^*} / \sigma(\text{d}, \alpha)_{g.s.}$ [74Su06].

Energy levels and branching ratios [93Bu08].

⁹⁵Y

E^*	$2J^\pi$	L	C^2S	σ (t, α)	C^2S	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(d, τ)	$\mu\text{b/sr}$	(t, α)	Γ_{cm}		E_{f}^* : $2J_{\text{f}}^\pi$:	0.0 1 ⁻	686 3 ⁻	827 5 ⁻	1087 9 ⁺	1631 (5 ⁺ ,7 ⁻)
0.0	1 ⁻	1	2.08	450	2.7	10.3(1) m	68Pr02						
685.8	3 ⁻	1	1.90	450	2.4		68Pr02	100					
826.9	5 ⁻	3	6.24	650	9.9		68Pr02	100					
1087.5	9 ⁺			42		56.2(15) μs	99Ge01				100		
1630.9	(5 ⁺ ,7 ⁻)									99(12)		1.5	
1889.8	5 ⁻	3	1.47	210	2.5		68Pr02				100		
1963.4	1 ⁽⁻⁾ ,3,5 ⁻									95(11)	5.2		
2021.0	1 ⁽⁻⁾ ,3,5 ⁻							27		67(9)	7		
2046.6	1,3,5 ⁻	1	1.41	330	2.2		68Pr02	39(6)		61(9)			
2207.6	(5 ⁻)											13	87(10)
2308(10)	3 ⁻			25	0.19		83Fl06						
2408.5	1 ⁽⁻⁾ ,3,5 ⁻									82(11)	18		
2557.5	1,3,5 ⁻							29		71			
2614.6	1 ⁽⁻⁾ ,3,5 ⁻									6			72(9)
2684.0	1,3							100					
2717.2	1,3							91(11)		9.3(14)			
2781.8	1 ⁽⁻⁾ ,3							83(12)		10(5)	7		
2855(20)													
2933.3	(3 ⁺)							50(6)		47(6)	1		1
3116.8	1,3							69(11)		31			
3352.9	1 ⁽⁻⁾ ,3							65(10)		12			
3391.8	1 ⁽⁻⁾ ,3									13(2)	2		
3507.4	1,3							56		44			
3576.6	1 ⁽⁻⁾ ,3							18		40(6)	14(2)		
3616.1	1,3							69(10)		15			
3651.3	1,3							39		61			
3743.3	1,3							100					
3943.5	1 ⁽⁻⁾ ,3							30		20	50		
4075.1	1 ⁽⁺⁾ ,3 ⁽⁺⁾							87(13)		10			
4160.7	1 ⁽⁻⁾ ,3									62	38		

(continued)

⁹⁵Y₃₉

E^*	$2J^\pi$	L	C^2S	σ (t, α)	C^2S	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(d, τ)	μ b/sr	(t, α)	Γ_{cm}		E_{f}^* : $2J_{\text{f}}^\pi$:	0.0 1 ⁻	686 3 ⁻	827 5 ⁻	1087 9 ⁺	1631 $\langle 5^+, 7^- \rangle$
4190.4	1,3								17				
4214.3	1,3								36	36			
4268.1	1,3								87(16)	13			
4348.3	1,3								100				
4360.3	1,3								44	56			
4420.5	1,3								100				
4563.4	1,3									100			
				83F106			Ref.						
			68Pr02		83F106		Ref.						

Energy levels and branching ratios [93Bu08]. Part 2

⁹⁵Y₃₉

E^*	$2J^\pi$	$E_f^*:$ $2J_f^\pi:$	1889.8 5 ⁻	1963.4	2021.0	2207.6 $\langle 5^- \rangle$	2408.5	2614.6	2684.0 1,3	2717.2 1,3	2933.3 $\langle 3^+ \rangle$
[keV]											
2614.6	1 ⁽⁻⁾ , 3, 5 ⁻		11	4		7					
2933.3	$\langle 3^+ \rangle$			1							
3352.9	1 ⁽⁻⁾ , 3					8			9		6
3391.8	1 ⁽⁻⁾ , 3			20	5	9		34(4)	7		10
3576.6	1 ⁽⁻⁾ , 3			10				18			
3616.1	1,3						6		2	8	
4075.1	1 ⁽⁺⁾ , 3 ⁽⁺⁾			3							
4190.4	1,3				83						
4214.3	1,3			27							

Energy levels and branching ratios [93Pe02].

⁹⁶Y₃₉

E^*	J^π	$T_{1/2}$ or
[keV]		Γ_{cm}
0	0 ⁻	5.34(5) s
0.0+X	$\langle 8 \rangle^+$	9.6(2) s
122.297(3)	1 ⁻	203(6) ps
652.29(6)	2 ⁻	≤ 21 ps
718.70(8)	1 ⁺ , 2 ⁺	
931.70(3)	1 ⁺	≤ 21 ps
1287.89(17)		
1983.58(18)	1 ⁺	

Energy levels and branching ratios [93Pe02]. Part 2

⁹⁶₃₉Y

E^* [keV]	J^π	Branching ratios in percentage						
		E_f^* : J_f^π :	0 0 ⁻	122.3 1 ⁻	652.3 2 ⁻	718.7 1 ⁺ , 2 ⁺	931.7 1 ⁺	1287.9
122.297(3)	1 ⁻		100					
652.29(6)	2 ⁻		4.9(16)	95.1(41)				
718.70(8)	1 ⁺ , 2 ⁺			100				
931.70(3)	1 ⁺		12.7(8)	77.6(25)	8.9(4)	0.8(2)		
1287.89(17)				12.50(625)			87.5(125)	
1983.58(18)	1 ⁺		56.2(67)	4.5(22)	18.0(45)		11.2(45)	10.11(112)