

Energy levels and branching ratios [00Wu08].

 $^{46}_{23}\text{V}$

E^*	J^π	T	L	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, t)	Γ_{cm}		$\frac{E^*_f}{J^\pi_f}$:	0.0 0 ⁺	801 3 ⁺	915 2 ⁺	994 1 ⁺	1180 4 ⁺
0.0	0 ⁺	1	0	422.50(11) ms	71Fa02						
801.5(1)*	3 ⁺		$\langle 4+2 \rangle$	1.02(7) ms	71Fa02		100				
914.93(10)	2 ⁺	1	2		71Fa02		100	≥ 0.2			
993.6(3)	1 ⁺	0	2		71Fa02		x				
1179.6(4)	4 ⁺				99Fr14			100			
1224.9(1)*	5 ⁺		$\langle 6 \rangle$	0.42(14) ns	71Fa02			100			
1236.5(6)	$\langle 0^- \rangle$									x	
1254	$\langle 3^- \rangle$							x	x		
1262.6								x	x		
1366.5(3)**	2 ⁻						22(4)				
1376.1(4)	3 ⁺	0	$\langle 2+4 \rangle$		71Fa02				19(3)	58(9)	
1431.8(5)	$\langle 1,2 \rangle$						100		98(15)	1.6(4)	
1539.8(3)	6 ⁺				99Fr14						42(7)
1604.2(2)*	7 ⁺			0.75(12) ns							
1666(1)***	3 ⁻								100		
1725.6(4)	5 ⁺	0									6(2)
1795.8(12)	$\langle 4^- \rangle$										
1833.9(9)									x		
1956.0(4)**	4 ⁻										
2054.8(4)	4 ⁺	1			99Fr14				11(2)		
2062.5(10)								100			
2299(15)											
2370.9(6)	$\langle 3,4 \rangle$										x
2388(1)***	5 ⁻										
2429.9(16)	$\langle 5^- \rangle$										
2449(15)	1 ⁺ , 2 ⁺		$\langle 2 \rangle$		71Fa02						
2564(15)											
2686(15)											
2756.9(8)											
2814.9(9)											
2833.9(8)											
2867.6(12)											
2877(15)											
2924(1)**	6 ⁻										
2977(15)											
3093.6(4)*	9 ⁺										
3110.7(7)											
3145.3(7)											
3188.9(16)											
3217(15)											
3266(15)											
3315.1(6)	8 ⁺										
3365.7(8)	6 ⁺	1									
3406.0(11)	$\langle 6^- \rangle$										
3407.8(11)											

(continued)

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E^*	J^π	T	L	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]			(τ, t)	Γ_{cm}		E^*_f : J^π_f :	0.0 0 ⁺	801 3 ⁺	915 2 ⁺	994 1 ⁺	1180 4 ⁺
3522(1)***	7 ⁻										
3615(15)											
3641.4(7)	7 ⁺	0									
3658(15)											
3731(15)											
3791(15)											
3871(15)											
3881(15)											
≈ 4010											
4184(1)**	8 ⁻										
4224.8(7)	$\langle 7^- \rangle$										
≈ 4330											
4476.0(7)	$\langle 8^- \rangle$										
4566.1(8)*	11 ⁺										
4844.3(11)	$\langle 8^+ \rangle$										
4917.4(7)	10 ⁺										
4932(1)***	9 ⁻										
4946.1(8)	$\langle 9^- \rangle$										
5282(1)**	10 ⁻										
6255(1)***	11 ⁻										
7105(1)*	13 ⁺										
7165(1)**	12 ⁻										
7727.8(11)	$\langle 11^+ \rangle$										
8199(2)***	13 ⁻										
8268.2(13)	$\langle 12^+ \rangle$										
8487.6(13)*	15 ⁺										
9811(2)**	14 ⁻										
10104.6(17)	$\langle 14^+ \rangle$										
10851(2)***	15 ⁻										
11756.7(17)	$\langle 16^+ \rangle$										
11779(2)**	16 ⁻										
13631(2)***	17 ⁻										
			71Fa02		Ref.						

Additional data on this isotope can be found in [02Le21, 01Br29, 94Ko51, 72Be38].

* K=3⁺ band based on the level at $E^*=801$ keV;

** K=0⁻ band based on the level at $E^*=1368$ keV;

*** K=0⁻ band based on the level at $E^*=1665$ keV; low spin structure is discussed in [99Fr14].

Energy levels and branching ratios [00Wu08]. Part 2

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E^* [keV]	J^π	Branching ratios in percentage										
		E_f^* : J_f^π :	1225 5 ⁺	1236.5 0 ⁻	1254 3 ⁻	1366.5 2	1376.1 3 ⁺	1539.8 6 ⁺	1604.21 7 ⁺	1665.9 3	1725.6 5 ⁺	1795.8
1366.5(3)**	2 ⁻			0.6(1)								
1539.8(3)	6 ⁺		58(9)									
1604.2(2)*	7 ⁺		x									
1725.6(4)	5 ⁺		15(2)				76(11)	2(1)				
1795.8(12)	4 ⁻				x							
1956.0(4)**	4 ⁻		x			x	x				x	
2054.8(4)	4 ⁺		8(3)				75(13)				7(2)	
2370.9(6)	3,4		x			x						x
2388(1)***	5 ⁻							x		x		
2429.9(16)	5 ⁻				x							x
2756.9(8)			x					x				
2833.9(8)			x									
2867.6(12)				x								
2924(1)**	6 ⁻		x					x			x	
3093.6(4)*	9 ⁺								x			
3110.7(7)			x					x				
3145.3(7)			x							x		
3188.9(16)												x
3315.1(6)	8 ⁺							x	x			
3365.7(8)	6 ⁺										100	
3407.8(11)								x				
3641.4(7)	7 ⁺		x								x	
4184(1)**	8 ⁻								x			
4224.8(7)	7 ⁻							x	x			
4476.0(7)	8 ⁻								x			
4844.3(11)	8 ⁺								100			

Energy levels and branching ratios [00Wu08]. Part 3

 $^{46}_{23}\text{V}$

E^* [keV]	J^π	Branching ratios in percentage											
		E_f^* :	1833.9	1956.0	2054.8	2370.9	2388.0	2923.6	3093.6	3315.1	3522.0	4183.6	4224.8
		J_f^π :		4^-	4^+	$\langle 3,4 \rangle$	5^-	6^-	9^+	8^+	7^-	8^-	$\langle 7^- \rangle$
2388(1)***	5^-			x									
2814.9(9)		x		x									
2833.9(8)					x								
2924(1)**	6^-		x										
3406.0(11)	$\langle 6^- \rangle$		x										
3522(1)***	7^-					x							
4184(1)**	8^-						x						
4476.0(7)	$\langle 8^- \rangle$						x						
4566.1(8)*	11^+							x					
4917.4(7)	10^+							x	x				

(continued)

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E^*	J^π	Branching ratios in percentage											
[keV]		E_f^* :	1833.9	1956.0	2054.8	2370.9	2388.0	2923.6	3093.6	3315.1	3522.0	4183.6	4224.8
		J_f^π :		4 ⁻	4 ⁺	$\langle 3,4 \rangle$	5 ⁻	6 ⁻	9 ⁺	8 ⁺	7 ⁻	8 ⁻	$\langle 7^- \rangle$
4932(1)***	9 ⁻										x		
4946.1(8)	$\langle 9^- \rangle$											x	x
5282(1)**	10 ⁻								x			x	
7727.8(11)	$\langle 11^+ \rangle$								x				

Energy levels and branching ratios [00Wu08]. Part 4

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E^*	J^π	Branching ratios in percentage											
	$E_f^*:$	4476.0	4566.1	4932.4	5282.4	6255.3	7104.7	7165.5	8199.4	8487.6	9811.5	10850.5	
[keV]	$J_f^\pi:$	$\langle 8^- \rangle$	11^+	9^-	10^-	11^-	13^+	12^-	13^-	15^+	14^-	15^-	
4946.1(8)	$\langle 9^- \rangle$	x											
6255(1)***	11^-			x									
7105(1)*	13^+		x										
7165(1)**	12^-				x								
8199(2)***	13^-					x							
8268.2(13)	$\langle 12^+ \rangle$		100										
8487.6(13)*	15^+						x						
9811(2)**	14^-							x					
10104.6(17)	$\langle 14^+ \rangle$									100			
10851(2)***	15^-								x				
11756.7(17)	$\langle 16^+ \rangle$									x			
11779(2)**	16^-										x		
13631(2)***	17^-											x	

Energy levels and branching ratios [95Bu05].

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E^* [keV]	$2J^\pi$	L	σ (τ, d) $\mu\text{b/sr}$	C^2S (τ, d)	C^2S' (τ, d)	σ (τ, d) $\mu\text{b/sr}$	$T_{1/2}$ or Γ_{cm}	Ref.
0.0	3 ⁻	1	580	0.04(1)	0.16	300	32.6(3) m	67Ro13
87.525(9)	5 ⁻		110			80	0.68(4) ns	
145.821(15)	7 ⁻	3	1420	0.58	4.85	1000	0.51(6) ns	67Ro13
259.486(4)	3 ⁺	2	450	0.08(3)	0.78	270	58(6) ps	67Ro13
660.358(9)	5 ⁺					140	1.6(12) ps	
1138.55(3)	7 ⁺						1.2(5) ps	
1271.80(5)	9 ⁻		40				0.25(8) ps	67Ro13
1294.96(6)	11 ⁻		incl				1.4(7) ps	67Ro13
1660.62(12)	1 ⁺	0	280	0.06(2)	0.07	300	0.37(16) ps	67Ro13
1746.96(4)	9 ⁺						624(90) fs	

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E^* [keV]	$2J^\pi$	L	σ (τ, d) $\mu\text{b/sr}$	C^2S (τ, d)	C^2S' (τ, d)	σ (τ, d) $\mu\text{b/sr}$	$T_{1/2}$ or Γ_{cm}	Ref.
1968.92(3)	3^+						0.44(12) ps	
2082.72(2)	3^-	1	7030	0.35(11)	1.49	3400	15(4) fs	67Ro13
2175.86(4)	5^-						15(5) fs	
2211.75(3)	1^-	1	2940	0.15(5)	0.66	1540	83(21) fs	67Ro13
2416	$\langle 11^+ \rangle$							
2439.54(4)	5^+		40				65(14) fs	67Ro13
2546(8)	$5^-, 7^-$	3	400	0.23(7)	300	1.62		67Ro13
2558	$\langle 13^- \rangle$							
2614.1(7)	$\langle 15^- \rangle$						<1.4 ps	
2722.63(7)	5^-	3	290	0.16(5)	130	0.70	36(10) fs	67Ro13
2747.12(16)	9^-						25(10) fs	
2767.32(6)	$\langle 1^- \rangle$	1	140	0.07(2)	180	0.07	10.4(28) fs	67Ro13
2810.04(12)	7^+						0.11(3) ps	
2984.29(11)	7^-						5(2) fs	
3005.45(3)	3^-	1	550	0.03(1)	300	0.12	6(2) fs	67Ro13
3054.22(15)	5^-						5(2) fs	
3247.73(8)	7^-	3		0.26(7)	290		76(21) fs	67Ro13
3272	$\langle 13^+ \rangle$							
3303.53(4)	3						32(7) fs	
3355.49(13)	5^+						5(2) fs	
3362.65(9)	1	1	630	0.07(2)	260	0.11	2.8(14) fs	67Ro13
3370.52(4)	$1, 3, 5^+$						11.8(21) fs	
3370.56(8)	3						<5 fs	
3517.08(15)	5		100				<6.9 fs	67Ro13
3524.60(12)	7^+						9.7(28) fs	
3590.35(6)	5						6(2) fs	
3659.71(14)	$\langle 7 \rangle$						14(4) fs	
3694.4(3)	$5, 3^+$						6(3) fs	
3718.0(3)	$7, 5, 9^+$							
3721.29(13)	7						15(6) fs	
3762.7(3)	$1-5$							
3773.4(2)	$\langle 1 \rangle$						<11 fs	
3822.6(2)	$1, 3$						19(9) fs	
3869.0(3)	5						9.7(35) ps	
3875.8(3)	$5, 3^-$						<8 fs	
3876.0(2)	7^-						<11 fs	
3890.1(2)	$1, 3, 5^+$						<3.5 ps	
3892.26(11)	$3, 5^+$						24(18) fs	
3952.6(4)	7						37(14) fs	
3955	$\langle 15^+ \rangle$							
3958.7(3)	3^+						9.0(28) fs	
3984.97(17)	$7, 3^+, 5^+$		40				24(9) fs	67Ro13
4080.60(12)	3^+						15(4) fs	
4099.06(14)	$5^-, 3^-$	1	1810	0.21(7)			<8.3 fs	67Ro13
4100.31(10)	3^-						5.5(21) fs	

(continued)

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E^*	$2J^\pi$	L	σ (τ, d)	C^2S	C^2S'	σ (τ, d)	$T_{1/2}$ or	Ref.
[keV]			$\mu\text{b/sr}$	(τ, d)	(τ, d)	$\mu\text{b/sr}$	Γ_{cm}	
4118.12(14)	3,1,5						13(4) fs	
4132.6(10)	$\langle 19^- \rangle$							
4150.35(11)	$5^{(-)}$		70				<7 fs	67Ro13
4197.3(3)	5		70				<11 fs	67Ro13
4207.10(14)	3,1,5							
4222.48(6)	5	3	350	0.14(4)			<11 fs	67Ro13
4271.60(20)	$7,3^+,5^+$							
4271.75(12)	$\langle 1 \rangle$						<11 fs	
4296(12)	$\langle 7 \rangle^-$	3	1090	0.20(6)				67Ro13
4345.19(10)	$\langle 1^+ \rangle$						<9 fs	
4392.80(20)	$3,1^-$	1	1030	0.12(4)			<24 fs	67Ro13
4402.6(3)	$7,5,9$						<28 fs	
4406.4(4)								
4453.7(2)	7						11(6) fs	
4509.52(14)	$7,3,5^+$							
4510.01(14)	$5,3^-$						<8.3 fs	
4514.5(3)	$3,1,5^-$	1	200	0.02(1)				67Ro13
4543.02(20)	$3,1,5^+$							
4568.68(20)	5						<9 fs	
4613(20)			170					67Ro13
4694.33(11)	$5^+,3^+$						<8.3 fs	
4719.2(3)	$3,1,5^-$	1	490	0.05(2)				67Ro13
4733.8(3)	9						<15 fs	
4792.9(3)	1,3							
4796.8(3)	$3,1^-,5^-$							
4807.30(14)	5						15(9) fs	
4852.5(3)	$5,1^-,3^-$							
4907.6(2)	$5,3^+,7^+$						<13 fs	
4955.12(13)	$1,3,5^+$							
4976.5(3)								
4998.7(3)	5,7							
5001	$\langle 17^+ \rangle$							
5016.0(3)	$3,5^+$						<15 fs	
5108.65(13)	$1,3,5^+$							
5123.86(14)	$7,5^+$							
5142.16(9)	$3,1^-,5^-$		130				<11 fs	67Ro13
5222.71(20)	$3,5^+$		70					67Ro13
5240.0(3)	$5,3^+,7^+$						<5 fs	
5244(20)	$1^-,3^-$	1	1520	0.17(5)				67Ro13
5387(20)			160					67Ro13
5474(20)			170					67Ro13
5538(20)								
5585(12)	$1^-,3^-$	1	830	0.09(3)				67Ro13
5635.8(3)	3^-	1	2820	0.14(4)			<19 fs	67Ro13
5711(20)								

(continued)

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E^*	$2J^\pi$	L	σ (τ, d)	C^2S	C^2S'	σ (τ, d)	$T_{1/2}$ or	Ref.
[keV]			$\mu\text{b/sr}$	(τ, d)	(τ, d)	$\mu\text{b/sr}$	Γ_{cm}	
5738(3)	1,3						<7 fs	
5748(20)			350					67Ro13
5853.25(11)	1		420				<8 fs	67Ro13
5885.0(2)	3		860				<7 fs	67Ro13
5886	$\langle 19^+ \rangle$							
5887.17(5)	1						<2 fs	
5894.43(13)	1						<5 fs	
5905.5(11)	$\langle 23^- \rangle$							
5928(20)			270					67Ro13
5962.0(4)	1						<8.3 fs	
5994.1(4)	3						<6 fs	
6023.4(3)	1^-						<1.4 fs	
6040(20)	1^+	0	400					67Ro13
6087.3(2)	5						<5 fs	
6121.86(9)	1						<3 fs	
6132.39(4)	1^+						<1.4 fs	
6157.30(9)	$\langle 5 \rangle$						<17 fs	
6165.97(9)	$3^{\langle - \rangle}$		420				<1.4 fs	67Ro13
6190.37(9)	$\langle 3 \rangle$						<2 fs	
6229.46(11)	5^+						<3 fs	
6239.80(9)	3						<0.7 fs	
6270.69(9)	$\langle 3 \rangle$						<0.4 fs	
6296.35(9)	3^-						<1.4 fs	
6350.73(10)	$\langle 3 \rangle$							
6373.56(9)	$\langle 1 \rangle$						<2 fs	
6387.01(9)	$\langle 5^+ \rangle$						<3 fs	
6392.5(24)			300					67Ro13
6393.63(12)	5^+		incl				<1.4 fs	
6425.60(13)	3		340				<1.4 fs	67Ro13
6427.12(13)	5						<1.4 fs	
6475.09(8)	5						<1.4 fs	
6570(20)			140					67Ro13
6679.38(18)	$7^{\langle - \rangle}$						<1.4 fs	
6682.84(5)								
6692.86(18)	1^+						<0.9 fs	
6708			500					67Ro13
6749(20)			210					67Ro13
6871	$\langle 21^+ \rangle$							
6895(20)			130					67Ro13
6953.4(3)	9^+		570				<7 fs	67Ro13
7008(20)			660					67Ro13
7400	$\langle 25^- \rangle$							
7884	27^-							
10003	31^-							
10768	29^-							02To05

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 $^{47}_{23}\text{V}$

E^*	$2J^\pi$	L	σ (τ, d)	C^2S	C^2S'	σ (τ, d)	$T_{1/2}$ or	Ref.
[keV]			$\mu\text{b/sr}$	(τ, d)	(τ, d)	$\mu\text{b/sr}$	Γ_{cm}	
			67Ro13	67Ro13	69Cu02	69Cu02		Ref.
								Ref.

Additional data on this isotope can be found in [02To05, 99Be23, 94Ca04, 73Ma01, 73Ko01, 71Ok06, 69Cu02, 67Do03, 67St20].

Evaluated values of proton transfer parameter C^2S in [95Bu05] are based on data from [67Ro13] presented in two first columns; independent data from [69Cu02] are given in the separate columns.

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

Energy levels and branching ratios [95Bu05]. Part 2

 $^{47}_{23}\text{V}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	0.0 3 ⁻	87.5 5 ⁻	145.8 7 ⁻	259.5 3 ⁺	660.4 5 ⁺	1138 7 ⁺	1272 9 ⁻	1295 11 ⁻	1661 1 ⁺	1747 9 ⁺
87.525(9)	5 ⁻		100									
145.821(15)	7 ⁻		0.6(4)	99.4(4)								
259.486(4)	3 ⁺		89(2)	11(2)								
660.358(9)	5 ⁺		38.0(3)	14.1(3)	18.1(2)	29.9(2)						
1138.55(3)	7 ⁺			38.0(4)	4.4(2)	32.5(4)	25.0(5)					
1271.80(5)	9 ⁻			18.2(1)	81.8(1)							
1294.96(6)	11 ⁻				100							
1660.62(12)	1 ⁺		25.3(3)			73.4(4)	1.3(1)					
1746.96(4)	9 ⁺				36(2)	46(1)	17(1)					
1968.92(3)	3 ⁺		2.9(2)	54.3(3)		9(1)	32(1)	0.9(2)			1.4(4)	
2082.72(2)	3 ⁻		28.1(3)	69.9(2)	1.7(1)		0.3(1)					
2175.86(4)	5 ⁻		76.6(4)	21.5(4)	1.6(1)	0.3(1)						
2211.75(3)	1 ⁻		80.6(2)	4.3(1)		14.5(2)					0.6(1)	
2416	$\langle 11^+ \rangle$							86	3			11
2439.54(4)	5 ⁺		8(1)	2(1)	15.4(4)	36(2)	27(1)				0.9(3)	
2558	$\langle 13 \rangle^-$								62	38		
2614.1(7)	$\langle 15 \rangle^-$								<3	98		
2722.63(7)	5 ⁻		55(1)	18.3(5)	20(1)	1.2(2)		5.2(2)	0.8(1)			
2747.12(16)	9 ⁻			7(1)	86(1)				5.3(4)	1.8(5)		
2767.32(6)	$\langle 1 \rangle^-$		100									
2810.04(12)	7 ⁺			43(1)	0.8(4)	2.8(4)	23.5(3)	2.7(4)	10.8(3)			12.1(4)
2984.29(11)	7 ⁻		1.3(5)	12(1)	58(1)				28.9(5)			
3005.45(3)	3 ⁻		35.5(3)	64.5(3)								
3054.22(15)	5 ⁻			43(1)	57(1)							
3247.73(8)	7 ⁻		18(2)	19(2)	18(2)				10(1)	12(2)		
3272	$\langle 13^+ \rangle$									6		79
3303.53(4)	3			72(2)		7.6(4)	9(3)					
3355.49(13)	5 ⁺		4.1(4)			78(1)	18(1)					
3362.65(9)	1		98.0(3)									

(continued)

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	0.0 3^-	87.5 5^-	145.8 7^-	259.5 3^+	660.4 5^+	1138 7^+	1272 9^-	1295 11^-	1661 1^+	1747 9^+
3370.52(4)	1,3,5 ⁺		64(1)			28(1)						
3370.56(8)	3		35(2)	65(2)								
3517.08(15)	5		10(2)	54(3)	36(3)							
3524.60(12)	7 ⁺					1.6(3)	66.6(4)	31.8(4)				
3590.35(6)	5		78(4)	3(2)	19(2)							
3659.71(14)	$\langle 7 \rangle$			29(1)			28(2)		44(4)			
3694.4(3)	5,3 ⁺			13(2)		71(2)	16(1)					
3718.0(3)	7,5,9 ⁺				100							
3721.29(13)	7			5.1(5)		1.5(4)	74(1)	19(1)				
3762.7(3)	1–5		22(12)	49(7)			29(7)					
3773.4(2)	$\langle 1 \rangle$		100									
3822.6(2)	1,3		72(3)			19(2)					6(1)	
3869.0(3)	5			3(1)	86(1)	11(1)						
3875.8(3)	5,3 ⁻		35(3)		38(3)							
3876.0(2)	7 ⁻			27(3)						73(3)		
3890.1(2)	1,3,5 ⁺					83(9)					17(4)	
3892.26(11)	3,5 ⁺					86(3)						
3952.6(4)	7						50(8)	32(7)	18(4)			
3958.7(3)	3 ⁺		40(1)			29(2)	24(2)					
3984.97(17)	7,3 ⁺ ,5 ⁺			9(2)			84(4)	7(2)				
4080.60(12)	3 ⁺			27(2)		63(3)	10(2)					
4099.06(14)	5 ⁻ ,3 ⁻		44(1)	5(1)	38(1)	14(1)						
4100.31(10)	3 ⁻		71(3)	18(1)		11(1)						
4118.12(14)	3,1,5		100									
4150.35(11)	5 ⁽⁻⁾		50(1)	37(1)	13(1)							
4197.3(3)	5		100									
4207.10(14)	3,1,5					49(14)						
4222.48(6)	5		65(2)	35(2)								
4271.60(20)	7,3 ⁺ ,5 ⁺					60(8)	40(8)					
4271.75(12)	$\langle 1 \rangle$		65(11)								35(5)	
4345.19(10)	$\langle 1^+ \rangle$		19(3)			27(4)	40(3)					
4392.80(20)	3,1 ⁻		38(5)	62(10)								
4402.6(3)	7,5,9								100			
4406.4(4)						100						
4453.7(2)	7				60(10)			40(5)				
4509.52(14)	7,3,5 ⁺						100					
4510.01(14)	5,3 ⁻		38(2)	62(11)								
4543.02(20)	3,1,5 ⁺		11(3)			89(3)						
4568.68(20)	5		100									
4694.33(11)	5 ⁺ ,3 ⁺					100						
4719.2(3)	3,1,5 ⁻			20(6)								
4733.8(3)	9								33(13)	67(10)		
4792.9(3)	1,3		80(8)									
4796.8(3)	3,1 ⁻ ,5 ⁻		60(4)	11(2)								
4807.30(14)	5				52(8)		48(12)					

(continued)

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	0.0 3 ⁻	87.5 5 ⁻	145.8 7 ⁻	259.5 3 ⁺	660.4 5 ⁺	1138 7 ⁺	1272 9 ⁻	1295 11 ⁻	1661 1 ⁺	1747 9 ⁺
4852.5(3)	5,1 ⁻ ,3 ⁻			37(8)		63(8)						
4907.6(2)	5,3 ⁺ ,7 ⁺						100					
4955.12(13)	1,3,5 ⁺					100						
4976.5(3)			100									
4998.7(3)	5,7			71(17)	29(13)							
5016.0(3)	3,5 ⁺		100									
5108.65(13)	1,3,5 ⁺		100									
5123.86(14)	7,5 ⁺						48(15)	30(4)				22(4)
5142.16(9)	3,1 ⁻ ,5 ⁻		100									
5222.71(20)	3,5 ⁺		100									
5240.0(3)	5,3 ⁺ ,7 ⁺						100					
5635.8(3)	3 ⁻		19	30							6	
5738(3)	1,3			4		72	11				9	
5853.25(11)	1		1.4			2.9						
5885.0(2)	3		21	37							12	
5887.17(5)	1		80								3.6	
5894.43(13)	1		21			25					39	
5962.0(4)	1		29			7.3					21	
5994.1(4)	3		6			21	28				4.2	
6023.4(3)	1 ⁻		67	2.3								
6087.3(2)	5		5	1.0	0.8	4	35	8				2.0
6121.86(9)	1		1.9			19					48	
6132.39(4)	1 ⁺		37			15	12					
6157.30(9)	$\langle 5 \rangle$		6.5	3.6	2.0	26	17	30				
6165.97(9)	3 ⁽⁻⁾			8.5		2.4						
6190.37(9)	$\langle 3 \rangle$		25	3.4		50	12					
6229.46(11)	5 ⁺		1.6	2.9	3.5	2.9	3.0				0.5	2.0
6239.80(9)	3		5.0	36		1.2	1.2				0.7	
6270.69(9)	$\langle 3 \rangle$		13	49		4.6						
6296.35(9)	3 ⁻		54	2.6							5.6	
6350.73(10)	$\langle 3 \rangle$		28	17	0.6	9.8	1.8				3.4	
6373.56(9)	$\langle 1 \rangle$		15			11					32	
6387.01(9)	$\langle 5^+ \rangle$		1.8	3.4			23	1.7				
6393.63(12)	5 ⁺			0.5	0.7	2.6	13					
6425.60(13)	3		3.2	3.7	0.3	0.9	1.0				2.0	
6427.12(13)	5			28		3.4	29	5.0				
6475.09(8)	5		7.4		0.4	7.4	20	2.1				
6679.38(18)	7 ⁽⁻⁾			10	10				19			1.4
6682.84(5)			12.9	2.6			3.6				1.1	
6692.86(18)	1 ⁺					52					39	
6708				42.7			1.7					
6953.4(3)	9 ⁺				12				5	9		61

Energy levels and branching ratios [95Bu05]. Part 3

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	1969 3^+	2083 3^-	2176 5^-	2212 1^-	2416 $\langle 11^+ \rangle$	2440 5^+	2558 $\langle 13 \rangle^-$	2614 $\langle 15 \rangle^-$	2723 5^-	2747 9^-
2439.54(4)	5^+		11(1)									
2614.1(7)	$\langle 15 \rangle^-$								≈ 2			
2810.04(12)	7^+		3.2(3)					0.8(3)				
3247.73(8)	7^-				23(1)							
3272	$\langle 13^+ \rangle$						15					
3303.53(4)	3		7(1)	4.5(5)								
3362.65(9)	1			2.0(3)								
3370.52(4)	$1, 3, 5^+$		5(1)	2.9(5)								
3822.6(2)	1, 3			3(1)								
3875.8(3)	$5, 3^-$			27(2)								
3892.26(11)	$3, 5^+$			3(1)	12(1)							
3955	$\langle 15^+ \rangle$						92					
3958.7(3)	3^+		2(1)	4.3(4)								
4132.6(10)	$\langle 19^- \rangle$									100		
4207.10(14)	$3, 1, 5$		51(14)									
4345.19(10)	$\langle 1^+ \rangle$			14(4)								
4719.2(3)	$3, 1, 5^-$			29(13)	51(4)							
4792.9(3)	1, 3			20(4)								
4796.8(3)	$3, 1^-, 5^-$			26(2)		4(1)						
5001	$\langle 17^+ \rangle$									30		
5635.8(3)	3^-			37		8						
5738(3)	1, 3				4							
5853.25(11)	1			60		24						
5885.0(2)	3			6		13		8				
5887.17(5)	1			14		2.2						
5894.43(13)	1			7.7		6.5						
5962.0(4)	1	16				21						
5994.1(4)	3			2.4	17	4.3		2.0			4.9	
6023.4(3)	1^-	1.6		17		6.1						
6087.3(2)	5	1.0			1.0			33				
6121.86(9)	1	8.0	8.6			4.7						
6132.39(4)	1^+	13				3.9		4.5				
6157.30(9)	$\langle 5 \rangle$	4.2						3.4				
6165.97(9)	$3^{(-)}$		3.4		4.5	37					11	
6190.37(9)	$\langle 3 \rangle$				1.4						2.0	
6229.46(11)	5^+	24		2.1	4.7			14				
6239.80(9)	3			0.5	30	5.0		1.3				
6270.69(9)	$\langle 3 \rangle$										9.8	
6296.35(9)	3^-	1.3	5.3		1.3			1.9				
6350.73(10)	$\langle 3 \rangle$	2.3	11		0.9	7.1		0.9			2.9	
6373.56(9)	$\langle 1 \rangle$	2.0	1.4			5.5						
6387.01(9)	$\langle 5^+ \rangle$	8.1						3.3				
6393.63(12)	5^+	6.8	3.9					4.6			0.7	
6425.60(13)	3	4.0			31	38						
6427.12(13)	5	23						7.4				

(continued)

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	1969 3^+	2083 3^-	2176 5^-	2212 1^-	2416 $\langle 11^+ \rangle$	2440 5^+	2558 $\langle 13 \rangle^-$	2614 $\langle 15 \rangle^-$	2723 5^-	2747 9^-
6475.09(8)	5		21	4.4				1.7				
6679.38(18)	$7^{\langle - \rangle}$				0.4			4.3			9.4	6.7
6682.84(5)			0.5	0.8	3.8						4.1	
6692.86(18)	1^+			3.3								
6708				12.7	2.0							

Energy levels and branching ratios [95Bu05]. Part 4

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	2767 $\langle 1 \rangle^-$	2810 7^+	2984 7^-	3005 3^-	3054 5^-	3248 7^-	3272 $\langle 13^+ \rangle$	3304 3	3355 5^+	3363 1
3955	$\langle 15^+ \rangle$								8			
5001	$\langle 17^+ \rangle$								70			
5894.43(13)	1									1.1		
5994.1(4)	3		4.9			2.3						
6023.4(3)	1^-											3.3
6087.3(2)	5					1						
6121.86(9)	1		1.5									
6132.39(4)	1^+									6.1		1.9
6157.30(9)	$\langle 5 \rangle$										1.0	
6165.97(9)	$3^{\langle - \rangle}$		1.6			9.6						2.4
6190.37(9)	$\langle 3 \rangle$		1.9			2.0						
6229.46(11)	5^+			23		2.9				1.2		
6239.80(9)	3		3.3			0.5	2.9					1.2
6270.69(9)	$\langle 3 \rangle$		1.1				2.0					2.0
6296.35(9)	3^-											2.5
6350.73(10)	$\langle 3 \rangle$		1.2			0.1	0.5					
6373.56(9)	$\langle 1 \rangle$		3.6									
6387.01(9)	$\langle 5^+ \rangle$			3.5	1.5		2.9				3.0	
6393.63(12)	5^+			10				0.7			8.8	
6425.60(13)	3		1.1							1.0		
6475.09(8)	5			3.5				0.5		20		
6679.38(18)	$7^{\langle - \rangle}$				22		3.5	3.8				
6682.84(5)			1.0			10.9	1.0					5.8
6708			2.1			2.2	4.1					

Energy levels and branching ratios [95Bu05]. Part 5

⁴⁷V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	3371 1,3,5 ⁺	3371 3	3517 5	3525 7 ⁺	3590 5	3659.7 ⟨7⟩	3694.4 5,3 ⁺	3718.0 7,5,9 ⁺	3721.3 7	3762.7 1–5
5853.25(11)	1		8.4									1.0
5885.0(2)	3						3					
5994.1(4)	3		1.0									
6087.3(2)	5							1.1				
6132.39(4)	1 ⁺		5.6	1.6								
6157.30(9)	⟨5⟩								4.9			
6165.97(9)	3 ^(−)			4.9								
6229.46(11)	5 ⁺					1.5		1.0		0.6	1.8	
6239.80(9)	3						2.5					
6270.69(9)	⟨3⟩			4.3	1.3		1.6					
6296.35(9)	3 [−]		9.8				2.0					
6350.73(10)	⟨3⟩			1.2	1.4	0.6	1.1					
6373.56(9)	⟨1⟩			1.8	1.0							
6387.01(9)	⟨5 ⁺ ⟩					28		2.1			1.1	
6393.63(12)	5 ⁺					26		3.5	1		6.4	
6425.60(13)	3			1.9			2.4					
6427.12(13)	5					2.3					1.1	
6475.09(8)	5							2.7	1.2			
6679.38(18)	7 ^(−)				2.3		0.5			0.6	0.4	
6682.84(5)				6.0	6.0	6.3	5.5					
6692.86(18)	1 ⁺			1.6								
6708				5.4	5.4	5.2	4.0					

Energy levels and branching ratios [95Bu05]. Part 6

⁴⁷V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	3773.4 ⟨1⟩	3822.6 1,3	3869.0 5	3875.8 5,3 [−]	3876.0 7 [−]	3890.1 1,3,5 ⁺	3892.26 3,5 ⁺	3952.6 7	3955 ⟨15 ⁺ ⟩	3958.7 3 ⁺
5853.25(11)	1		2.0									
5886	⟨19 ⁺ ⟩										100	
5962.0(4)	1								3.0			
5994.1(4)	3		1.0	1.6								
6023.4(3)	1 [−]			1.3								
6087.3(2)	5									4.7		
6121.86(9)	1											8.7
6157.30(9)	⟨5⟩											1.5
6229.46(11)	5 ⁺				4.2							
6270.69(9)	⟨3⟩								1.5			
6296.35(9)	3 [−]		0.8									
6350.73(10)	⟨3⟩			0.3		0.3						0.4
6373.56(9)	⟨1⟩		4.3					2.5				3.4
6387.01(9)	⟨5 ⁺ ⟩				5.4							

(continued)

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	3773.4 $\langle 1 \rangle$	3822.6 1,3	3869.0 5	3875.8 5,3 ⁻	3876.0 7 ⁻	3890.1 1,3,5 ⁺	3892.26 3,5 ⁺	3952.6 7	3955 $\langle 15^+ \rangle$	3958.7 3 ⁺
6393.63(12)	5 ⁺									1.0		
6425.60(13)	3				2.2							
6475.09(8)	5									2.5		1.2
6679.38(18)	7 ⁽⁻⁾						1.3					
6682.84(5)									1.3			
6692.86(18)	1 ⁺							1.8				1.1
6953.4(3)	9 ⁺									13		

Energy levels and branching ratios [95Bu05]. Part 7

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	3985 7,3 ⁺ ,5 ⁺	4080.6 3 ⁺	4099.1 5 ⁻ ,3 ⁻	4100.3 3 ⁻	4118.1 3,1,5	4132.6 $\langle 19^- \rangle$	4150.4 5 ⁽⁻⁾	4197.3 5	4207.1 3,1,5	4222.5 5
5905.5(11)	$\langle 23^- \rangle$							100				
5962.0(4)	1						1.5					
6087.3(2)	5											1.3
6165.97(9)	3 ⁽⁻⁾				2.0				8.4	1.3		
6190.37(9)	$\langle 3 \rangle$											1.4
6229.46(11)	5 ⁺								0.3	0.3		
6239.80(9)	3				1.0	3.7						1.1
6270.69(9)	$\langle 3 \rangle$					6.3						1.9
6296.35(9)	3 ⁻				4.4		2.9			1.1		
6350.73(10)	$\langle 3 \rangle$			1.0		1.7	0.5		0.1	0.2		0.9
6373.56(9)	$\langle 1 \rangle$			9		1.0					2.2	
6387.01(9)	$\langle 5^+ \rangle$	5.5										
6393.63(12)	5 ⁺	3.2		1.1					0.1			
6425.60(13)	3					2.4	1.7		2.5			
6427.12(13)	5			1.2								
6475.09(8)	5	0.6		2.6								
6679.38(18)	7 ⁽⁻⁾											1.4
6682.84(5)												11.2
6692.86(18)	1 ⁺										1.5	
6708												7.5

Energy levels and branching ratios [95Bu05]. Part 8

 $^{47}_{23}\text{V}$

E^*	$2J^\pi$	Branching ratios in percentage									
[keV]	E_f^* : $2J_f^\pi$:	4271.6 7,3 ⁺ ,5 ⁺	4271.7 ⟨1⟩	4345.2 ⟨1 ⁺ ⟩	4392.8 3,1 ⁻	4402.6 7,5,9	4406.4	4453.7 7	4509.5 7,3,5 ⁺	4510.0 5,3 ⁻	4514.5 3,1,5 ⁻
5962.0(4)	1		1.3								
6165.97(9)	3 ^{⟨-⟩}		1.5							1.1	
6239.80(9)	3			1.1	0.4						0.3
6270.69(9)	⟨3⟩				2.2						
6296.35(9)	3 ⁻	0.9								1.9	
6350.73(10)	⟨3⟩		0.6						0.4		0.1
6387.01(9)	⟨5 ⁺ ⟩						1.3	1.4	1.6		
6393.63(12)	5 ⁺							1.3	0.7		
6679.38(18)	7 ^{⟨-⟩}					0.4					
6682.84(5)			2.6	2.6						3.8	3.8
6708			1.2	1.2							

Energy levels and branching ratios [95Bu05]. Part 9

 $^{47}_{23}\text{V}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]	E_f^* : $2J_f^\pi$:	4543.0 3,1,5 ⁺	4568.7 5	4694.3 5 ⁺ ,3 ⁺	4719.2 3,1,5 ⁻	4733.8 9	4796.8 3,1 ⁻ ,5 ⁻	4807.3 5	4852.5 5,1 ⁻ ,3 ⁻	4907.6 5,3 ⁺ ,7 ⁺	4998.7 5,7	
6023.4(3)	1 ⁻						1.4					
6190.37(9)	⟨3⟩		1.4									
6229.46(11)	5 ⁺			1.4								
6239.80(9)	3		0.8		0.4						0.3	
6296.35(9)	3 ⁻						0.6		0.5			
6350.73(10)	⟨3⟩		1.0								0.1	
6373.56(9)	⟨1⟩	3.5										
6393.63(12)	5 ⁺							0.4		0.7		
6679.38(18)	7 ⁽⁻⁾		0.4			0.8					0.3	
6682.84(5)			1.9									
6708			1.8									

Energy levels and branching ratios [95Bu05]. Part 10

 $^{47}_{23}\text{V}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	5001 $\langle 17^+ \rangle$	5016.0 $3, 5^+$	5123.9 $7, 5^+$	5142.2 $3, 1^-, 5^-$	5222.7 $3, 5^+$	5240.0 $5, 3^+, 7^+$	5244 $1^-, 3^-$	5905.5 $\langle 23^- \rangle$	7400 $\langle 25^- \rangle$	7884 $\langle 27^- \rangle$
6229.46(11)	5^+			0.7								
6296.35(9)	3^-				0.3							
6350.73(10)	$\langle 3 \rangle$			0.2	0.1							
6387.01(9)	$\langle 5^+ \rangle$							1.2				
6392.5(24)										x		

(continued)

 $^{47}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	5001 $\langle 17^+ \rangle$	5016.0 $3,5^+$	5123.9 $7,5^+$	5142.2 $3,1^-,5^-$	5222.7 $3,5^+$	5240.0 $5,3^+,7^+$	5244 $1^-,3^-$	5905.5 $\langle 23^- \rangle$	7400 $\langle 25^- \rangle$	7884 $\langle 27^- \rangle$
6393.63(12)	5^+				0.8			1.3				
6475.09(8)	5						0.5					
6682.84(5)						0.4			0.6			
6708								1.0				
6871	$\langle 21^+ \rangle$		94							6		
7400	$\langle 25^- \rangle$									100		
7884	27^-									56	44	
10003	31^-											100

Energy levels and branching ratios [93Bu04].

 $^{48}_{23}\text{V}$

E^* [keV]	J^π	L (τ, p)	σ (τ, p) $\mu\text{b/sr}$	L (τ, d)	C^2S' (τ, d)	L (τ, t)	σ (τ, t) μb	$T_{1/2}$ or Γ_{cm}	Ref.
0.0	4^+			1+3	0.02+0.33	4	20	15.974(3) d	68Do06
308.27(5)	2^+	2		1+3	0.004+0.2	2	82	7.11(4) ns	68Do06
420.65(7)	1^+		54(8)			2	81	<1 ns	75Ma13
427.91(8)	5^+	0+2		3	0.87			6.1(10) ps	68Do06
518.66(8)	1^-			3^*	0.15			2.72(6) ns	68Do06
613.38(7)	4^+			3	0.83			15.0(8) ps	68Do06
627.29(10)	6^+					6	12	75(6) ps	75Ma13
744.98(8)	2^-					3	10	17.3(18) ps	75Ma13
764.96(7)	3^+			3	0.66	4	4	≤ 2.6 ps	68Do06
776.2(10)	$3,5$				incl				68Do06
1055.77(12)	3^-			3^*	0.06	3	8	4.5(11) ps	68Do06
1099.18(13)	4^-			3^*	0.38	5,6	3	4.5(4) ps	68Do06
1120.8(13)	2,3,4								
1254.6(6)	7^+					8	32	<3.5 ps	75Ma13
1264.59(16)	5^+							≤ 1.9 ps	
1326(8)									
1521.39(10)	2^+			1	0.02	$\langle 2 \rangle$	10	≤ 3.0 ps	68Do06
1557.55(15)	4^-						20	≤ 2.8 ps	75Ma13
1685.47(24)	$5^{(-)}$						2	≤ 3.0 ps	75Ma13
1691.5(19)	2,3								
1730(8)	5^+-7^+					6	30		75Ma13
1764(7)									
1780.98(14)	3^+			1	0.04	4	21		68Do06
1998.44(17)	$2^-,3^-$			0	0.06				68Do06
2062.42(24)	$5^{(-)}$							<2.1 ps	
2098(10)									
2120(10)	1^+-3^+			1	0.09	2	34		68Do06
2187(10)	2^--4^-					3	24		75Ma13

(continued)

**⁴⁸V
23**

E^*	J^π	L	σ (τ, p)	L	$C^2 S'$	L	σ (τ, t)	$T_{1/2}$ or	Ref.
[keV]		(τ, p)	$\mu b/sr$	(τ, d)	(τ, d)	(τ, t)	μb	Γ_{cm}	
2197.6(23)	2^+			1	0.04				68Do06
2231.8(6)	$8^{(+)}$								
2258(7)	1^+-4^+			1+3	0.03+0.1		2		68Do06
2295(6)	1^+	0+2	182(27)				2		74Ha55
2337.4(14)	$2-4$								
2397.7(6)	$6^{(-)}$								
2412(7)	1^+	0+2	69(14)	3	0.26	2	90		73Sm12
2447.4(17)	2^+	2		1+3	0.08+0.7				68Do06
2470(3)	$2^-, 3^-$					3	20		75Ma13
2493.7(19)	$3-5$								
2577(8)	1^+-4^+			1+3	0.02+0.04		3		68Do06
2604.8(23)	$2, 3, 4$					2	17		75Ma13
2620(10)									
2626.6(6)	$9^{(+)}$							<1.2 ps	
2708(7)	4^--6^-					5	11		75Ma13
2773(13)	1^+-4^+			1	0.30				68Do06
2779.4(9)	$\langle 6^- \rangle$								
2789.5(23)	$3^-, 4^-$					3	59		75Ma13
2823(3)	$\langle 4^- \rangle$					$\langle 5 \rangle$	14		75Ma13
2884(9)							27		75Ma13
2937(8)	1^+-4^+			1	0.06		17		68Do06
2959(10)							incl		
3013(3)	$\langle 1-4 \rangle$			3	0.13				68Do06
3018(11)**	$\langle 0 \rangle^+$	0	409(47)				377		73Sm12
3043(9)	$\langle 0^+ \rangle$								
3074(3)	1^+-4^+			1	0.07				68Do06
3168(15)	1^+-4^+			1	0.08				68Do06
3172.2(7)	$\langle 7^- \rangle$								
3243.4(22)	2^+			1	0.09				68Do06
3294(15)	1^+-4^+			1	0.04				68Do06
3322(15)	1^+-4^+			1	0.05				68Do06
3371(15)	1^+-4^+			1+3	0.02+0.1				68Do06
3425	$\langle 7^- \rangle$								
3440(15)	1^+-4^+			1	0.06				68Do06
3523(15)	1^+-4^+			1	0.04				68Do06
3565(3)	2^+-4^+			1	0.12				68Do06
3586.0	$\langle 7^- \rangle$								
3699(9)	1^+	0+2	268(36)	1	0.06				73Sm12
3736(15)	1^+-4^+			1	0.02				68Do06
3801(15)	1^+-4^+			1	0.06				68Do06
3866	1^+	0+2	416(47)						73Sm12
3977.1(9)	$\langle 8^- \rangle$								
4017(15)**	$\langle 2 \rangle^+$			3	0.58				68Do06
4086(15)	1^+-4^+			1	0.05				68Do06
4150.1									

(continued)

⁴⁸V
23

E^*	J^π	L	σ (τ, p)	L	$C^2 S'$	L	σ (τ, t)	$T_{1/2}$ or	Ref.
[keV]		(τ, p)	$\mu b/sr$	(τ, d)	(τ, d)	(τ, t)	μb	Γ_{cm}	
4307.1(9)	11 ⁽⁺⁾								
4390.9(9)	9 ⁻								
4674.6(10)									
4698(15)	1 ⁺	0+2	210(30)						73Sm12
4798(15)	1 ⁺	0+2	98(18)						73Sm12
4966.7(10)									
6240.2(13)	13 ⁽⁺⁾								
8285	15 ⁺								
8584	14 ⁺								
		73Sm12	74Ha55		68Do06		75Ma13		Ref.

Additional data on this isotope can be found in [02Br42, 94Ca04, 91Ca30, 72Be38].

* Inconsistency with adopted levels was noticed in [85Al14].

** Identified as Isobar analog state (IAS, $T=2$) of ⁴⁸Ti ground state and the first excitation with $E^*=983$ keV [68Do06,85Al14].

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

Energy levels and branching ratios [93Bu04]. Part 2

⁴⁸V
23

E^*	J^π	Branching ratios in percentage									
E_f^* : J_f^π :		0.0	308	421	428	519	613	627	745	765	1055.8
[keV]		4 ⁺	2 ⁺	1 ⁺	5 ⁺	1 ⁻	4 ⁺	6 ⁺	2 ⁻	3 ⁺	3 ⁻
308.27(5)	2 ⁺	100									
420.65(7)	1 ⁺		100								
427.91(8)	5 ⁺	100									
518.66(8)	1 ⁻		66	34(7)							
613.38(7)	4 ⁺	89(2)			11(2)						
627.29(10)	6 ⁺	59			41(6)						
744.98(8)	2 ⁻		4.9(5)	3.1(4)		92(1)					
764.96(7)	3 ⁺	44(2)	54(2)				2.2(3)				
776.2(10)	3,5	100									
1055.77(12)	3 ⁻	6(3)				8(2)	0.2		86		
1099.18(13)	4 ⁻	93					7.1				
1120.8(13)	2,3,4	66(14)	34(14)								
1254.6(6)	7 ⁺				2.0			98			
1264.59(16)	5 ⁺						75(5)	25(5)			
1521.39(10)	2 ⁺		45(4)	35(4)						20(2)	
1557.55(15)	4 ⁻								19(4)		68(4)
1691.5(19)	2,3	69(10)				31(10)					
1780.98(14)	3 ⁺	15(3)	43(5)				42(5)				
1998.44(17)	2 ⁻ , 3 ⁻								x		
2062.42(24)	5 ⁽⁻⁾						26				22(5)
2197.6(23)	2 ⁺	75(23)									25(6)

(continued)

 $^{48}_{23}\text{V}$

E^* [keV]	J^π	Branching ratios in percentage										
		$E_f^*:$ $J_f^\pi:$	0.0 4 ⁺	308 2 ⁺	421 1 ⁺	428 5 ⁺	519 1 ⁻	613 4 ⁺	627 6 ⁺	745 2 ⁻	765 3 ⁺	1055.8 3 ⁻
2231.8(6)	8 ⁽⁺⁾								57			
2295(6)	1 ⁺			100								
2337.4(14)	2-4			17(8)				49(8)				
2397.7(6)	6 ⁽⁻⁾					8			46			
2412(7)	1 ⁺			x	x							
2447.4(17)	2 ⁺		≈15				25(12)	29(12)				31(10)
2470(3)	2 ⁻ , 3 ⁻			96(33)			≈4					
2493.7(19)	3-5		39(12)		26(12)							35(10)
2604.8(23)	2, 3, 4		≈23	49(23)				x				
2789.5(23)	3 ⁻ , 4 ⁻		45(18)									
2823(3)	⟨4 ⁻ ⟩		21(11)								79(42)	
3013(3)	⟨1-4⟩			≈89							≈11	
3018(11)**	⟨0 ⁺ ⟩				100							
3074(3)	1 ⁺ -4 ⁺			100								
3172.2(7)	⟨7 ⁻ ⟩								29			
3243.4(22)	2 ⁺		55(27)				≈45					
3565(3)	2 ⁺ -4 ⁺		57(29)			43(22)						
3699(9)	1 ⁺			100								
3866	1 ⁺			x	x							
4698(15)	1 ⁺			100								
4798(15)	1 ⁺					100						

Energy levels and branching ratios [93Bu04]. Part 3

 $^{48}_{23}\text{V}$

E^* [keV]	J^π	Branching ratios in percentage										
		$E_f^*:$ $J_f^\pi:$	1099.2 4 ⁻	1120.8 2, 3, 4	1254.6 7 ⁺	1557.5 4 ⁻	1685.5 5 ⁽⁻⁾	1691.5 2, 3	2062.4 5 ⁽⁻⁾	2231.8 8 ⁽⁺⁾	2397.7 6 ⁽⁻⁾	2626.6 9 ⁽⁺⁾
1557.55(15)	4 ⁻		14									
1685.47(24)	5 ⁽⁻⁾		100									
1998.44(17)	2 ⁻ , 3 ⁻		x									
2062.42(24)	5 ⁽⁻⁾					52(5)						
2231.8(6)	8 ⁽⁺⁾				43							
2337.4(14)	2-4		x	34(6)								
2397.7(6)	6 ⁽⁻⁾						46					
2604.8(23)	2, 3, 4							29(12)				
2626.6(6)	9 ⁽⁺⁾				67					33		
2779.4(9)	⟨6 ⁻ ⟩					31(10)			69(10)			
2789.5(23)	3 ⁻ , 4 ⁻			55(11)								
3172.2(7)	⟨7 ⁻ ⟩										71	
3586.0	⟨7 ⁻ ⟩								32(15)			
3977.1(9)	⟨8 ⁻ ⟩									17	26	6
4150.1												x

(continued)

⁴⁸V₂₃

E^*	J^π	Branching ratios in percentage										
[keV]		E_f^* :	1099.2	1120.8	1254.6	1557.5	1685.5	1691.5	2062.4	2231.8	2397.7	2626.6
		J_f^π :	4^-	2,3,4	7^+	4^-	$5^{(-)}$	2,3	$5^{(-)}$	$8^{(+)}$	$6^{(-)}$	$9^{(+)}$
4307.1(9)	$11^{(+)}$											100
4390.9(9)	9^-											x
4674.6(10)												x
4966.7(10)												x

Energy levels and branching ratios [93Bu04]. Part 4

⁴⁸V₂₃

E^* [keV]	J^π	Branching ratios in percentage						
		E_f^* : J_f^π :	2779.4 6 ⁻	3168 1 ⁺ -4 ⁺	3172.2 7 ⁻	3977.1 8 ⁻	4307.1 11 ⁽⁺⁾	6240.2 13 ⁽⁺⁾
3425	7 ⁻		100					
3586.0	7 ⁻		68(15)					
3977.1(9)	8 ⁻				51			
4390.9(9)	9 ⁻			23		77		
6240.2(13)	13 ⁽⁺⁾						100	
8285	15 ⁺							100
8584	14 ⁺							100

Energy levels and branching ratios [95Bu23].

⁴⁹V₂₃

E^* [keV]	$2J^\pi$	$2T$	L	C^2S' (τ ,d)	σ (τ ,d) μ b/sr	C^2S' (τ ,d)	σ (τ ,d) μ b/sr	C^2S' (τ ,d)	C^2S' (¹⁶ O, ¹⁵ N)	L	C^2S (t, α)	L	R (p,t)	σ (p,t) μ b/sr	$T_{1/2}$ or Γ_{cm}	Ref.
0.0	7 ⁻		3	4.3	520	4.9	2500	4.8	3.6	3	2.96	0	1.00	36400	330(15) d	78Sh22
90.639(2)	5 ⁻				20		110			3	0.21	2	1.11	1300	228(13) ps	68Ba02
152.93(1)	3 ⁻		1	0.17	110	0.17	1200	0.1	0.03	1	0.12	2	1.10	1200	19.9(0,2) ns	76Ma51
748.27(9)	3 ⁺		2	0.36	50	0.26	760	0.8		2	2.7				5.3(6) ps	69Pu02
1021.6(1)	11 ⁻								0.12			2	0.94	6100	3.4(6) ps	76Ma51
1140.5(1)	5 ⁺										0.1				1.3(6) ps	68Ba02
1155.3(1)	9 ⁻								0.045			2	2.00	5500	1.1(3) ps	83Sa29
1183																
1514.5(1)	5 ⁻											2	1.17	2500	31(12) fs	83Sa29
1602.7(1)	7 ⁺														0.5(2) ps	
1610	9 ⁻ ,11 ⁻															
1643.2(2)	3 ⁻ ,5 ⁻														36(11) fs	
1646.4(2)	1 ⁺			0.21	380	0.08				0	1.54				7(1) ps	68Ba02
1661.4(1)	3 ⁻		1	0.50	4370	0.71	7300	0.7	0.6			2	0.80	1200	16(7) fs	68Ba02
1994.7(4)	3 ⁽⁺⁾									[2]	0.12				0.5(2) ps	68Ba02
2178.3(4)	9 ⁺														0.5(3) ps	

(continued)

⁴⁹V
23

E^*	$2J^\pi$	L	C^2S'	σ (τ, d)	C^2S'	σ (τ, d)	C^2S'	C^2S'	L	C^2S	L	R	σ (p,t)	$T_{1/2}$ or	Ref.
[keV]			(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	(τ, d)	(¹⁶ O, ¹⁵ N)		(t, α)		(p,t)	$\mu b/sr$	Γ_{cm}	
2182.0(4)	7 ⁻	3	0.79	220	0.98	800	1.0				0+2	1.25	5000	33(12) fs	68Ba02
2204	5 ⁻ , 7 ⁻	3	0.63					1.8							68Ba02
2234.0(7)	5										2	$\langle 1.7 \rangle$	600	12(8) fs	83Sa29
2263.3(2)	15 ⁻										4	0.70	1200	0.6(2) ps	83Sa29
2265.3(3)	5 ⁻								3	0.07				35(9) fs	68Ba02
2279	1 ⁻ , 3 ⁻	1	0.55	1260	0.59	6900	0.7								68Ba02
2309.4(6)	3 ⁻	1	1.31	2500	1.16	13000	1.3		1	0.02	2		600	14(7) fs	68Ba02
2353.4(4)	9 ⁻										2	0.50	1400	33(12) fs	83Sa29
2388.0(5)	5 ⁺								2	0.41				57(20) fs	68Ba02
2408.3(4)	$\langle 7^- \rangle$										0	0.56	2700	<8 fs	83Sa29
2671.0(3)	$\langle 11^- \rangle$										2	1.67	1400	<11 fs	83Sa29
2671.3(9)	7 ⁻ -11 ⁺													<33 ps	
2680(2)	$\langle 7, 9 \rangle$														
2727.5(3)	15 ⁻										2+4	0.8	700	0.10(4) ps	83Sa29
2741.0(5)	11 ⁺													0.4(2) ps	
2786.4(3)	$\langle 9^- \rangle$										2	0.23	600	<11 fs	83Sa29
2797(2)															
2808.3(7)	5 ⁺								2	0.12				0.32(6) ps	68Ba02
2810.9(5)	5 ⁻ , 7 ⁻	3	0.79			740	0.8				2	0.33	400	<12 fs	83Sa29
2861.5(5)	13 ⁻										4	1.43	2000	0.10(6) ps	83Sa29
3017.3(7)											2	1.11	500	<33 ps	83Sa29
3133.9(5)	$\langle 9-13 \rangle$										0+2			0.22(4) ps	83Sa29
3134.0(6)	7, 9 ⁺	4	0.25										3200	<33.3 ps	68Ba02
3152(1)															
3224(1)	1-5 ⁻														
3239.5(9)	7 ⁻													<33 ps	
3242(2)	3, 5, 7 ⁻												700		83Sa29
3248	1 ⁺	0	0.01						0	0.13	0				68Ba02
3259.5(4)	$\langle \geq 9 \rangle$														
3303.2(9)	3 ⁻ , 5-9													<33 ps	
3305(3)	$\langle 13^- \rangle$										4	$\langle 0.6 \rangle$	500		83Sa29
3325(2)	$\langle 1^+-7^+ \rangle$														
3325.2(4)	$\langle 17^- \rangle$											1.18	≈ 1400		83Sa29
3340(1)														<33 ps	
3341.8(7)	$\langle 13^+ \rangle$														
3342(2)	$\langle 1^+-9^+ \rangle$														
3388(1)	$\langle 3, 5^- \rangle$														
3388.5(9)	5, 7												1000	<33 ps	
3405	$\langle 3^- \rangle$	1	0.02			360									68Ba02
3462.9(17)	$\langle 3^+-9^+ \rangle$													<33 ps	
3479(3)	$\langle 7^- \rangle$												1600		83Sa29
3500.6(10)														<33 ps	
3516(2)	$\langle 3^- - 9^- \rangle$														
3521(2)	$\langle \leq 9 \rangle$														
3531(2)	$\langle \leq 7^- \rangle$														

(continued)

 $^{49}_{23}\text{V}$

E^*	$2J^\pi$	$2T$	L	C^2S'	σ (τ, d)	C^2S'	σ (τ, d)	C^2S'	C^2S'	L	C^2S	L	R	σ (p,t)	$T_{1/2}$ or	Ref.
[keV]				(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(τ, d)	($^{16}\text{O}, ^{15}\text{N}$)		(t, α)		(p,t)	$\mu\text{b/sr}$	Γ_{cm}	
3531.1(6)	$5^-, 7, 9^+$													400	<33 ps	
3603(2)																
3609(3)	$\langle 7^- \rangle$													1700		83Sa29
3612(6)	$\langle \geq 11^- \rangle$															
3623.9(20)	≤ 9													2600	<33 ps	83Sa29
3639.8(8)	$\langle 7^- \rangle$													1300	<33 ps	83Sa29
3665.9(7)	11														<33 ps	
3671(2)	$\langle 1^+ - 9^+ \rangle$															
3678(2)	$\langle 7^- \rangle$													1900		83Sa29
3694(6)	$3^+, 5^+$									2	0.46					68Ba02
3721(2)	$\langle \leq 7^- \rangle$													1200		83Sa29
3741(2)	$1^-, 3^-$		1	0.08	220		0.09									68Ba02
3742.4(6)	$\langle 19^- \rangle$											6	1.28	1700		83Sa29
3757(2)	$5^-, 7^-$		3	0.18			920	0.2		3	0.09					68Ba02
3771(2)	$\langle 1^+ - 9^+ \rangle$															
3782(2)	$\langle \geq 9 \rangle$															
3795(3)	$X^{\langle - \rangle}$													1300		83Sa29
3816(2)	$\langle \leq 7^- \rangle$															
3825(3)	$X^{\langle - \rangle}$													400		83Sa29
3841(2)	$1^{\langle + \rangle} - 5^-$															
3885.2(27)														800		83Sa29
3912(2)	$\langle 3^- \rangle$		1	0.29	660		0.27	3600	0.3					1000		68Ba02
3927(2)	$\langle 1^+ - 9^+ \rangle$															
3960(2)	$\langle 3^- - 7^- \rangle$															
3975(3)	$X^{\langle - \rangle}$													1800		83Sa29
4002(2)	$\langle 3^- \rangle$		1	0.04	100		0.04	690	0.06							68Ba02
4035(2)	$\langle 3^- - 9^+ \rangle$															
4048(3)														1100		83Sa29
4064(6)																
4088(2)	$3^{\langle - \rangle} - 7$															
4098(2)	$\langle \leq 7^- \rangle$													2100		83Sa29
4129(2)	$\langle 5^- \rangle$		3	0.10												68Ba02
4152(2)																
4165(3)														2400		83Sa29
4218(2)	$\langle 3^- \rangle$		1	0.08	430		0.17	1500	0.1					1000		68Ba02
4253(2)	$1^-, 3^-$		1	0.05	incl			incl								68Ba02
4259(2)	$\langle 3, 5, 7 \rangle$															
4270(2)														1000		83Sa29
4289(2)	$3^+, 5^+$									2	0.55					68Ba02
4316(11)														1700		83Sa29
4359(2)																
4373(2)	$1^-, 3^-$		1	0.04	200		0.07	590	0.04							68Ba02
4397(2)	$5^-, 7^-$									3	0.12					68Ba02
4422(2)																
4436(6)																

(continued)

⁴⁹V₂₃

E^*	$2J^\pi$	$2T$	L	C^2S'	σ (τ, d)	C^2S'	σ (τ, d)	C^2S'	C^2S'	L	C^2S	L	R	σ (p,t)	$T_{1/2}$ or Γ_{cm}	Ref.
[keV]				(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(τ, d)	($^{16}\text{O}, ^{15}\text{N}$)		(t, α)		(p,t)	$\mu\text{b/sr}$		
4470(6)																
4498(2)	$5^-, 7^-$															
4502	$1^-, 3^-$		1	0.22	530	0.21	2700	0.2								68Ba02
4540(2)																
4590(2)																
4599																
4635(2)	$\langle 5^- \rangle$		3	2.11	370	0.15	1900	1.4		3	0.42					68Ba02
4662(6)	$3^+, 5^+$									2	0.13					68Ba02
4740(2)	$3^+, 5^+$									2	0.19					68Ba02
4796(6)	$\langle \geq 11 \rangle$															
4840(2)	$1^-, 3^-$		1	0.27	560	0.22	2900	0.2								68Ba02
4863(6)																
4885(6)																
4947(2)	$1^-, 3^-$		1	0.02			420	0.04								68Ba02
4959	1^+									0	0.05					68Ba02
4988(6)																
5010(6)	$5^-, 7^-$									3	0.11					68Ba02
5042(2)																
5057	$1^-, 3^-$		1	0.05			690	0.06								68Ba02
5072	$3^+, 5^+$									2	0.15					68Ba02
5134(6)																
5212(2)	$1^-, 3^-$		1	0.15			2100	0.2								68Ba02
5230(2)																
5257	$1^-, 3^-$		1	0.03												68Ba02
5292(6)	1^+									0	0.07					68Ba02
5347(6)	$\langle 3^+, 5^+ \rangle$									$\langle 2 \rangle$	0.21					68Ba02
5387(6)	$1^-, 3^-$		1	0.02												68Ba02
5411(6)	$5^-, 7^-$		3	0.35												68Ba02
5522	1^+									0	0.09					68Ba02
5529.7(7)	$\langle 21^- \rangle$															
5554																
5597	$1^-, 3^-$		1	0.03												68Ba02
5631	$\langle 3^+, 5^+ \rangle$									$\langle 2 \rangle$	0.16					68Ba02
5676	$1^-, 3^-$		1	0.04												68Ba02
5689.9(8)	$\langle 23^- \rangle$															
5718	$1^-, 3^-$		1	0.03												68Ba02
5826	$5^-, 7^-$		3	0.13												68Ba02
5889	$1^-, 3^-$		1	0.02												68Ba02
5931	$\langle 3^+, 5^+ \rangle$									$\langle 2 \rangle$	0.14					68Ba02
5947	$5^-, 7^-$		3	0.10												68Ba02
5987	$1^-, 3^-$		1	0.06			1400	0.1								68Ba02
6045	$1^-, 3^-$		1	0.04												68Ba02
6058	$\langle 3^+, 5^+ \rangle$									$\langle 2 \rangle$	0.27					68Ba02
6146	$1^-, 3^-$		1	0.10												68Ba02
6184																

(continued)

 $^{49}_{23}\text{V}$

E^*	$2J^\pi$	$2T$	L	C^2S'	σ (τ, d)	C^2S'	σ (τ, d)	C^2S'	C^2S'	L	C^2S	R	σ (p,t)	$T_{1/2}$ or	Ref.
[keV]				(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(τ, d)	($^{16}\text{O}, ^{15}\text{N}$)		(t, α)	(p,t)	$\mu\text{b/sr}$	Γ_{cm}	
6220	$1^-, 3^-$		1	0.08			1400	0.1							68Ba02
6258							incl								
6286															
6333	$1^-, 3^-$		1	0.05			1900	0.2							68Ba02
6368															
6392															
6430															
6474															
6521															
6555	$1^-, 3^-$		1	0.22											68Ba02
6563	$\langle 3^+, 5^+ \rangle$									$\langle 2 \rangle$	0.22				68Ba02
6603	$1^-, 3^-$		1	0.17											68Ba02
6661(30)															
6683(30)															
6711(30)															
6816(30)															
6844.9(8)	$\langle 23^- \rangle$														
6856(30)															
6892(30)															
6943(30)															
6978(30)															
7054(30)															
7099(30)															
7137(30)							1900								69Pu02
7240(30)															
7290(30)															
7365(30)															
7430(30)							1700								69Pu02
7478(30)			$\langle 1 \rangle$				incl								
7554(30)															
7605(30)															
7645(30)															
7745.0	3^-	5	1	0.56										8.9(30) eV	76Ga04
7750	3^-	5	1	incl			7400							6.7(20) eV	69Pu02
7801.4(8)	$\langle 25^- \rangle$														
7838.7(21)	$\langle 1^- \rangle$														
7910.2(21)	$\langle 1^- \rangle$														
7943.5(21)	$\langle 3^- \rangle$														
8013.0(21)	$\langle 3^- \rangle$														
8058.1(21)	$\langle 3, 5^+ \rangle$														
8071.8(21)	$\langle 5 \rangle$														
8092.6	$\langle 1^- \rangle$	5	1	0.3			3100							53(15) eV	69Pu02
8104.2	$3^{\langle - \rangle}, 5$														
8117.5	3														
8131.5(21)	$\langle 3^- \rangle$														

(continued)

 $^{49}_{23}\text{V}$

E^*	$2J^\pi$	$2T$	L	C^2S'	σ (τ ,d)	C^2S'	σ (τ ,d)	C^2S'	C^2S'	L	C^2S	L	R	σ (p,t)	$T_{1/2}$ or	Ref.
[keV]				(τ ,d)	$\mu\text{b/sr}$	(τ ,d)	$\mu\text{b/sr}$	(τ ,d)	($^{16}\text{O},^{15}\text{N}$)		(t, α)		(p,t)	$\mu\text{b/sr}$	Γ_{cm}	
8192(30)																
8246(30)																
8290.3	$3^{\langle - \rangle}$															
8371(30)																
8405(30)																
8416.1(9)	$\langle 27^- \rangle$															
8444(30)																
8525.3(21)	$\langle 5 \rangle$															
8628.2(21)	$\langle 3^- \rangle$															
8633.1(21)	$\langle 5 \rangle$															
8640.9(21)	$\langle 3^- \rangle$															
8642.9(21)	$\langle 3^-, 5 \rangle$															
8682.0(21)	$\langle 5 \rangle$															
8784.9(21)	$\langle 5 \rangle$															
8788.8(21)	$\langle 5^- \rangle$															
8851.5(21)	$\langle 5^-, 7^- \rangle$															
8867.2(21)	$\langle 5 \rangle$															
8877.0(21)	$\langle 5 \rangle$															
8880.9(21)	$\langle 5 \rangle$															
8890.7(21)	$\langle 3^- \rangle$															
8893.6(21)	$\langle 5^- \rangle$															
8895.6(21)	$\langle 5 \rangle$															
8902.5(21)	$\langle 5 \rangle$															
8912.2(21)	$\langle 5 \rangle$	5														76Ga04
8921.1(21)	$\langle 5^+ \rangle$															
8925.0(21)	$\langle 7^- \rangle$															
8927.9(21)	$\langle 5 \rangle$															
8942.6(21)	$\langle 5 \rangle$															
8945(25)	$\langle 1^+ \rangle$															
8965.1(21)	$\langle 5^+ \rangle$															
8998.5(21)	$\langle 1^- \rangle$															
9008.2(21)	$\langle 5^+ \rangle$															
9029.8(21)	$\langle 5 \rangle$															
9037.6(21)	$\langle 5 \rangle$															
9044.5(21)	$\langle 7^- \rangle$															
9056.2(21)	$\langle 5 \rangle$															
9071.9(21)	$\langle 5 \rangle$															
9075.8(21)	$\langle 5 \rangle$															
9078.8(21)	$\langle 3^- \rangle$															
9082.7(21)	$\langle 3^+ \rangle$															
9089.5(21)	$\langle 3^-, 5 \rangle$															
9094.4(21)	$\langle 5 \rangle$															
9118.0(21)	$\langle 5 \rangle$															
9131.7(21)	$\langle 5 \rangle$															
9135.6(21)	$\langle 5 \rangle$															

(continued)

⁴⁹V
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E^*	$2J^\pi$	$2T$	L	C^2S'	σ (τ ,d)	C^2S'	σ (τ ,d)	C^2S'	C^2S'	L	C^2S	L	R	σ (p,t)	Ref.
[keV]				(τ ,d)	μ b/sr	(τ ,d)	μ b/sr	(τ ,d)	($^{16}\text{O}, ^{15}\text{N}$)	(t, α)		(p,t)		μ b/sr	
9148.3(21)	$\langle 5 \rangle$														
9154.2(21)	$\langle 5^+ \rangle$														
9161.1(21)	$\langle 1^-, 3 \rangle$														
9167.9(21)	$\langle 5 \rangle$														
9168.9(21)	$\langle 3^- \rangle$														
9174.8(21)	$\langle 5 \rangle$														
9182.6(21)	$\langle 5 \rangle$														
9193.4(21)	$\langle 5, 7^+ \rangle$														
9195.3(21)	$\langle 5 \rangle$														
9568(10)	$\langle 1^- \rangle$	5													76Ga04
9662(10)	3^-	5													76Ga04
10230(10)	$\langle 5 \rangle^-$	5	3	0.22											76Ga04
10925(7)	$\langle 5 \rangle^+$	5	2	0.12											76Ga04
11150(7)	$\langle 9^+ \rangle$	4	4	0.27											76Ga04
				68Ba02	69Cu02	69Cu02		69Pu02	78Sh22						Ref.
				76Ga04			69Pu02		76Ma51		68Ba02		83Sa29	83Sa29	Ref.

Additional data on this isotope can be found in [00Ro05, 91Ca23].

Four values C^2S' corresponding to proton transfer [68Ba02, 69Cu02, 69Pu02, 86Bu09] are given at left.Cross sections of two-neutron pickup σ (p,t) reaction and their ratio to the theoretically expected values [83Sa29] are given at right. $T_{1/2}$, uncertainties in E^* and parameters S_N of ($^{16}O, ^{15}N$) reaction are given in Supplement.

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

Energy levels and branching ratios [95Bu23]. Part 2

⁴⁹V
23

E^*	$2J^\pi$	Branching ratios in percentage										
		E_f^* :	0.0	90.6	153	748	1022	1140	1155	1514	1603	1643
[keV]		$2J_f^\pi$:	7^-	5^-	3^-	3^+	11^-	5^+	9^-	5^-	7^+	$\langle 3^-, 5 \rangle$
90.639(2)	5^-		100									
152.93(1)	3^-		59(2)	41(1)								
748.27(9)	3^+			46(1)	54(1)							
1021.6(1)	11^-		100									
1140.5(1)	5^+		54(2)	24(1)	17(1)	5.6(5)						
1155.3(1)	9^-		75(1)	22(1)			2.9(6)					
1514.5(1)	5^-		27(1)	9(1)	46(1)	17(5)						
1602.7(1)	7^+		27(1)	56(4)		8(2)		7.5(9)	0.9(4)			
1643.2(2)	$\langle 3^-, 5 \rangle$			<2	100							
1646.4(2)	$\langle 1^+ \rangle$				53(6)	47(6)						
1661.4(1)	3^-		9(1)	52(1)	34(1)	5(1)						
1994.7(4)	$3^{(+)}$			21(2)	34(2)	16(2)		29(7)				
2178.3(4)	9^+		62(3)				10(1)	21(1)	x		7(1)	

(continued)

 $^{49}_{23}\text{V}$

E^* [keV]	$2J^\pi$	$E_f^*:$ $2J_f^\pi:$	Branching ratios in percentage									
			0.0 7 ⁻	90.6 5 ⁻	153 3 ⁻	748 3 ⁺	1022 11 ⁻	1140 5 ⁺	1155 9 ⁻	1514 5 ⁻	1603 7 ⁺	1643 (3 ⁻ ,5)
2182.0(4)	7 ⁻		6(4)	71(6)					23(2)			
2234.0(7)	5		5(1)	64(1)	17(1)							
2263.3(2)	15 ⁻						100					
2265.3(3)	5 ⁻				95(14)							5.0
2309.4(6)	3 ⁻		20(2)	39(2)	33(2)	7						
2353.4(4)	9 ⁻		57(1)	6(1)			32(1)		5.0(10)			
2388.0(5)	5 ⁺		7(1)	17(1)	<5	59(3)		7(1)				
2408.3(4)	(7 ⁻)		58(1)	9(1)			4.0(8)	19	10.5(8)			
2671.0(3)	(11 ⁻)						75		25			
2671.3(9)	7 ⁻ -11 ⁺		6(1)	4(1)			90(1)					
2680(2)	(7,9)						50(6)		50(6)			
2727.5(3)	15 ⁻						50					
2741.0(5)	11 ⁺						<5		39(2)		48(2)	
2786.4(3)	(9 ⁻)		24(1)	4(1)			45(1)		24.0(10)		3(1)	
2797(2)			62(6)				38(6)					
2808.3(7)	5 ⁺		34(3)		30(3)	18(6)		8(2)			9(2)	
2810.9(5)	5 ⁻ ,7 ⁻		32(2)	43(2)				11(3)				
2861.5(5)	13 ⁻						x		78(5)			
3017.3(7)			14(2)	37(2)	40(2)						9(1)	
3134.0(6)	7,9 ⁺		41(1)	22(1)		7(1)	14(1)		16.0(10)			
3152(1)							38(6)	62(6)				
3224(1)	1-5 ⁻				50							
3239.5(9)	7 ⁻		8(1)	61(1)						31(1)		
3303.2(9)	3 ⁻ ,5-9		52(2)	21(3)								
3340(1)			73(2)									
3388(1)	(3,5 ⁻)									60		
3388.5(9)	5,7			14(6)		48(2)			19(2)			5(1)
3462.9(17)	(3 ⁺ -9 ⁺)	x									x	
3500.6(10)		55(4)										
3531(2)	(≤7 ⁻)				60							25
3531.1(6)	5 ⁻ ,7,9 ⁺		9(1)		34(1)				5(1)	13(1)		
3623.9(20)	≤9							100				
3639.8(8)	(7 ⁻)		12(1)				54(3)			27(3)		
3665.9(7)	11		66(2)									
3741(2)	1 ⁻ ,3 ⁻			37	37					25		
3816(2)	(≤7 ⁻)			100								
3841(2)	1 ⁽⁺⁾ -5 ⁻											40
3912(2)	(3 ⁻)				43							36
4002(2)	(3 ⁻)											60
4088(2)	3 ⁽⁻⁾ -7		24		29					35		
4129(2)	(5 ⁻)					100						
4498(2)	5 ⁻ ,7 ⁻				70				30			
4635(2)	(5 ⁻)		38	62								
4947(2)	1 ⁻ ,3 ⁻			100								
7745.0	3 ⁻		1.0	12.6	17	1.0						6.8

(continued)

 $^{49}_{23}\text{V}$

E^* [keV]	$2J^\pi$	$E_f^*:$ $2J_f^\pi:$	0.0 7 ⁻	90.6 5 ⁻	153 3 ⁻	748 3 ⁺	1022 11 ⁻	1140 5 ⁺	1155 9 ⁻	1514 5 ⁻	1603 7 ⁺	1643 $\langle 3^-, 5 \rangle$
Branching ratios in percentage												
7750	3 ⁻		1.0	30	1.0	1.0		1.0		1.0		10.9
7838.7(21)	$\langle 1^- \rangle$				8	11						43
7910.2(21)	$\langle 1^- \rangle$				24	15						
7943.5(21)	$\langle 3^- \rangle$		2	14	13	2		4				
8013.0(21)	$\langle 3^- \rangle$		14	3	9	62		3				
8058.1(21)	$\langle 3, 5^+ \rangle$			4	23	7		10		13		
8071.8(21)	$\langle 5 \rangle$		20	13	41	2						15
8092.6	$\langle 1^- \rangle$			1.0	65	1.0						
8104.2	3 ⁽⁻⁾ , 5		1	2	4	9		4		20		26
8117.5	3		2.0	4.0	22	8.0		10.0		2.0		7.0
8131.5(21)	$\langle 3^- \rangle$		1	2	7	5		36		9		11
8290.3	3 ⁽⁻⁾		4.2	3.2	7	41		21.1		1.1		
8525.3(21)	$\langle 5 \rangle$		1	37	9	7		9		2	1	
8628.2(21)	$\langle 3^- \rangle$		1	1	4	27		27				
8633.1(21)	$\langle 5 \rangle$		1	9	24	7		9		10	3	4
8640.9(21)	$\langle 3^- \rangle$		1	15	35	23				4		
8642.9(21)	$\langle 3^-, 5 \rangle$		2	18	8	18		9		3		
8682.0(21)	$\langle 5 \rangle$		23	3	45	4		1		5		
8784.9(21)	$\langle 5 \rangle$		33	23	6	9		5		5		
8788.8(21)	$\langle 5^- \rangle$		12	15	39	6		2	4	2	1	
8851.5(21)	$\langle 5^-, 7^- \rangle$		8	1	34			14	1	3	1	
8867.2(21)	$\langle 5 \rangle$		8	5	24	12		8		4	1	
8877.0(21)	$\langle 5 \rangle$		33	9	6	11		21		2		
8880.9(21)	$\langle 5 \rangle$		15	29				4		4	3	
8890.7(21)	$\langle 3^- \rangle$		2	7	15	30						
8893.6(21)	$\langle 5^- \rangle$		34	13	7	4		6	1	3	3	
8895.6(21)	$\langle 5 \rangle$		4	12	17	29		12		4	2	
8902.5(21)	$\langle 5 \rangle$		20	11	19	13		6		2		7
8912.2(21)	$\langle 5 \rangle$		37	18	8	5		3		1		
8921.1(21)	$\langle 5^+ \rangle$		17	13	19	8		3		4	10	
8925.0(21)	$\langle 7^- \rangle$		48	6	24			3		2	7	
8927.9(21)	$\langle 5 \rangle$		18	7	9	4		10		2	2	
8942.6(21)	$\langle 5 \rangle$		21	11	10	6		2		3	3	
8965.1(21)	$\langle 5^+ \rangle$		5	12	10	10		24		9		
8998.5(21)	$\langle 1^- \rangle$				64	12						
9008.2(21)	$\langle 5^+ \rangle$		3	3	34	5		5			1	
9029.8(21)	$\langle 5 \rangle$		48	4	5	3		2			1	8
9037.6(21)	$\langle 5 \rangle$		16	27	25	6		26				
9044.5(21)	$\langle 7^- \rangle$		15	11	15			13		3		
9056.2(21)	$\langle 5 \rangle$		25	16	30	8		2		3		
9071.9(21)	$\langle 5 \rangle$		12	21	17	5		4		2	2	
9075.8(21)	$\langle 5 \rangle$		19	12	10	2		7		7	5	6
9078.8(21)	$\langle 3^- \rangle$		5	5	9	58				6		4
9082.7(21)	$\langle 3^+ \rangle$			34	4	18		19				15
9089.5(21)	$\langle 3^-, 5 \rangle$		3	21	63	6						

(continued)

⁴⁹V
²³

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	0.0 7 ⁻	90.6 5 ⁻	153 3 ⁻	748 3 ⁺	1022 11 ⁻	1140 5 ⁺	1155 9 ⁻	1514 5 ⁻	1603 7 ⁺	1643 3 ⁻ ,5 ⁺
9094.4(21)	5		1	23	7	28		10		6		
9118.0(21)	5		6	17	6	5		6		21	3	
9131.7(21)	5		5	11	46	5					8	
9135.6(21)	5		19	8	39	11						
9148.3(21)	5		4	13	9	20				10	12	
9154.2(21)	5 ⁺		5	9	11	22				13		
9161.1(21)	1 ⁻ ,3			11	57	5						11
9167.9(21)	5		13	4	10	3		4		6	7	8
9168.9(21)	3 ⁻		5	2	66					2	2	8
9174.8(21)	5		35	6	17	14		8			4	
9182.6(21)	5		2	20		32		43		3		
9193.4(21)	5,7 ⁺		20	22		24						
9195.3(21)	5		21	5	4	19		16		8	4	

Energy levels and branching ratios [95Bu23]. Part 3

⁴⁹V
²³

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	1646 1 ⁺	1661 3 ⁻	1995 3 ⁺	2178 9 ⁺	2182 7 ⁻	2234 5	2263.3 15 ⁻	2265.3 5 ⁻	2309.4 3 ⁻	2353.4 9 ⁻
2234.0(7)	5			14(1)								
2388.0(5)	5 ⁺				10(1)							
2408.3(4)	7 ⁻					<3.6						
2727.5(3)	15 ⁻								50			
2741.0(5)	11 ⁺					13(1)						
2810.9(5)	5 ⁻ ,7 ⁻						14(2)					
2861.5(5)	13 ⁻									22(1)		
3224(1)	1-5 ⁻			50								
3303.2(9)	3 ⁻ ,5-9						28(3)					
3325.2(4)	17 ⁻											
3340(1)								27(4)				
3341.8(7)	13 ⁺					40(2)						
3388(1)	3,5 ⁻			40								
3531(2)	≤7 ⁻			15								
3531.1(6)	5 ⁻ ,7,9 ⁺						14(1)					25(1)
3639.8(8)	7 ⁻					7(2)						
3665.9(7)	11								11(2)			23(2)
3742.4(6)	19 ⁻								48			
3841(2)	1 ⁺ -5 ⁻			60								
3912(2)	3 ⁻								21			
4002(2)	3 ⁻										40	
4088(2)	3 ⁻ -7							12				
4253(2)	1 ⁻ ,3 ⁻		50	50								

(continued)

 $^{49}_{23}\text{V}$

E^* [keV]	$2J^\pi$	$E_f^*:$ $2J_f^\pi:$	Branching ratios in percentage									
			1646 $\langle 1^+ \rangle$	1661 3^-	1995 $3^{(+)}$	2178 9^+	2182 7^-	2234 5	2263.3 15^-	2265.3 5^-	2309.4 3^-	2353.4 9^-
4373(2)	$1^-, 3^-$			45				27			27	
4590(2)								100				
5212(2)	$1^-, 3^-$										100	
7745.0	3^-			4.9				1.9	1.0		2.9	
7750	3^-			3					1.0		5.0	
7838.7(21)	$\langle 1^- \rangle$			20						5		
7910.2(21)	$\langle 1^- \rangle$		7	15	11					6	15	
7943.5(21)	$\langle 3^- \rangle$			15	5			2		18	9	
8013.0(21)	$\langle 3^- \rangle$			4							4	
8058.1(21)	$\langle 3, 5^+ \rangle$		6		2			10		4	4	
8071.8(21)	$\langle 5 \rangle$									9		
8092.6	$\langle 1^- \rangle$		6.1	1.0								
8104.2	$3^{(-)}, 5$			7							7	
8117.5	3			5.0	13.0			3.0		3.0	3.0	
8131.5(21)	$\langle 3^- \rangle$			7	5							
8290.3	$3^{(-)}$		8.4	2.1	2.1						5.3	
8525.3(21)	$\langle 5 \rangle$			21	2							
8628.2(21)	$\langle 3^- \rangle$		13	6	10					4		
8633.1(21)	$\langle 5 \rangle$			3	3		4	3			7	
8640.9(21)	$\langle 3^- \rangle$		6								1	
8642.9(21)	$\langle 3^-, 5 \rangle$		7	10	3			3		1	1	
8682.0(21)	$\langle 5 \rangle$		3	4	2			1		2		
8784.9(21)	$\langle 5 \rangle$			10	5							
8788.8(21)	$\langle 5^- \rangle$						2				2	
8851.5(21)	$\langle 5^-, 7^- \rangle$							9				
8867.2(21)	$\langle 5 \rangle$			11	1			2		2	5	
8877.0(21)	$\langle 5 \rangle$			2				4			1	
8880.9(21)	$\langle 5 \rangle$		5		6		6	4			4	
8890.7(21)	$\langle 3^- \rangle$		13	4	3			2		4	3	
8893.6(21)	$\langle 5^- \rangle$			4	3		2	6		3	2	
8895.6(21)	$\langle 5 \rangle$			9	2					3		
8902.5(21)	$\langle 5 \rangle$		2		4			6			3	
8912.2(21)	$\langle 5 \rangle$		1	3	3			3		2	2	
8921.1(21)	$\langle 5^+ \rangle$		8		4	3	3				8	
8925.0(21)	$\langle 7^- \rangle$			2				2				
8927.9(21)	$\langle 5 \rangle$		15	10	2			7			4	
8942.6(21)	$\langle 5 \rangle$		13	13	3			1			6	
8965.1(21)	$\langle 5^+ \rangle$					2						
8998.5(21)	$\langle 1^- \rangle$		7							17		
9008.2(21)	$\langle 5^+ \rangle$		1		5						4	
9029.8(21)	$\langle 5 \rangle$			3	5			3			1	
9044.5(21)	$\langle 7^- \rangle$						11	7			11	
9056.2(21)	$\langle 5 \rangle$			3	6						7	
9071.9(21)	$\langle 5 \rangle$		6	5	4		2	1			10	
9075.8(21)	$\langle 5 \rangle$			6	6		2				6	

(continued)

⁴⁹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	1646 $\langle 1^+ \rangle$	1661 3^-	1995 $3^{(+)}$	2178 9^+	2182 7^-	2234 5	2263.3 15^-	2265.3 5^-	2309.4 3^-	2353.4 9^-
9078.8(21)	$\langle 3^- \rangle$			4								
9082.7(21)	$\langle 3^+ \rangle$			9								
9089.5(21)	$\langle 3^-, 5 \rangle$		2									
9094.4(21)	$\langle 5 \rangle$		10					3			2	
9118.0(21)	$\langle 5 \rangle$				10			11			2	
9131.7(21)	$\langle 5 \rangle$		11	4						6	4	
9135.6(21)	$\langle 5 \rangle$		8	15								
9148.3(21)	$\langle 5 \rangle$				13		7					
9154.2(21)	$\langle 5^+ \rangle$		5	8			3			5	13	
9161.1(21)	$\langle 1^-, 3 \rangle$							9		4		
9167.9(21)	$\langle 5 \rangle$			9	1			1		2	8	
9168.9(21)	$\langle 3^- \rangle$			3	5						3	
9174.8(21)	$\langle 5 \rangle$			8							3	
9193.4(21)	$\langle 5, 7^+ \rangle$		10		24							
9195.3(21)	$\langle 5 \rangle$			8							3	

Energy levels and branching ratios [95Bu23]. Part 4

⁴⁹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	2388.0 5^+	2408.3 $\langle 7^- \rangle$	2671.0 $\langle 11 \rangle^-$	2671.3	2680.0 $\langle 7, 9 \rangle$	2727.5 15^-	2741.0 11^+	2786.4 $\langle 9 \rangle^-$	2808.3 5^+	2810.9 $5^-, 7^-$
2861.5(5)	13^-							x				
3133.9(5)	$\langle 9-13 \rangle$				100							
3259.5(4)	$\langle \geq 9 \rangle$									100		
3325.2(4)	$\langle 17^- \rangle$							13.33				
3341.8(7)	$\langle 13^+ \rangle$					31(2)			29(1)			
3388.5(9)	$5, 7$									14(3)		
3500.6(10)				45(8)								
7745.0	3^-		1.0									
7943.5(21)	$\langle 3^- \rangle$											3
8058.1(21)	$\langle 3, 5^+ \rangle$		2									
8104.2	$3^{(-)}, 5$		4									
8117.5	3		3.0									
8131.5(21)	$\langle 3^- \rangle$		4									
8416.1(9)	$\langle 27^- \rangle$							31				
8525.3(21)	$\langle 5 \rangle$			1								
8628.2(21)	$\langle 3^- \rangle$											7
8633.1(21)	$\langle 5 \rangle$		2									
8640.9(21)	$\langle 3^- \rangle$										1	
8642.9(21)	$\langle 3^-, 5 \rangle$		1									1
8682.0(21)	$\langle 5 \rangle$		1	1								
8784.9(21)	$\langle 5 \rangle$		2	2								

(continued)

 $^{49}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	2388.0 5^+	2408.3 $\langle 7^- \rangle$	2671.0 $\langle 11 \rangle^-$	2671.3	2680.0 $\langle 7,9 \rangle$	2727.5 15^-	2741.0 11^+	2786.4 $\langle 9 \rangle^-$	2808.3 5^+	2810.9 $5^-, 7^-$
8788.8(21)	$\langle 5^- \rangle$		2	2			2					
8851.5(21)	$\langle 5^-, 7^- \rangle$		9	2							4	
8867.2(21)	$\langle 5 \rangle$		1	1								
8877.0(21)	$\langle 5 \rangle$		4									1
8880.9(21)	$\langle 5 \rangle$			1								
8893.6(21)	$\langle 5^- \rangle$										1	1
8912.2(21)	$\langle 5 \rangle$			2								4
8942.6(21)	$\langle 5 \rangle$		3									
8965.1(21)	$\langle 5^+ \rangle$			2			2					
9008.2(21)	$\langle 5^+ \rangle$		10	2								
9029.8(21)	$\langle 5 \rangle$		2	1								
9044.5(21)	$\langle 7^- \rangle$					3	3					
9071.9(21)	$\langle 5 \rangle$		2									1
9075.8(21)	$\langle 5 \rangle$			2								
9078.8(21)	$\langle 3^- \rangle$		6									
9089.5(21)	$\langle 3^-, 5 \rangle$		4									
9118.0(21)	$\langle 5 \rangle$										5	
9148.3(21)	$\langle 5 \rangle$		7									
9154.2(21)	$\langle 5^+ \rangle$										3	
9167.9(21)	$\langle 5 \rangle$		2	2							3	
9195.3(21)	$\langle 5 \rangle$		3	3								

Energy levels and branching ratios [95Bu23]. Part 5

 $^{49}_{23}\text{V}$

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	2861.5 13^-	3017.3	3133.9	3134.0 $7,9^{(+)}$	3224	3239.5 7^-	3242	3259.5 $\langle \geq 9 \rangle$	3325 $\langle 1^+ - 7^+ \rangle$	3325.2 $\langle 17^- \rangle$
3325.2(4)	$\langle 17^- \rangle$		23.3									
3742.4(6)	$\langle 19^- \rangle$											52
5529.7(7)	$\langle 21^- \rangle$											30
8013.0(21)	$\langle 3^- \rangle$						1					
8058.1(21)	$\langle 3, 5^+ \rangle$						1		3	1		
8092.6	$\langle 1^- \rangle$						4.0		1.0			
8104.2	$3^{(-)}, 5$						4					
8117.5	3						3.0					
8131.5(21)	$\langle 3^- \rangle$								1			
8640.9(21)	$\langle 3^- \rangle$			1				2				
8642.9(21)	$\langle 3^-, 5 \rangle$			4		1			1			1
8682.0(21)	$\langle 5 \rangle$						1			2		
8788.8(21)	$\langle 5^- \rangle$			3			2		1			
8851.5(21)	$\langle 5^-, 7^- \rangle$			3			2					
8867.2(21)	$\langle 5 \rangle$			1		3			1			

(continued)

⁴⁹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	2861.5 13^-	3017.3	3133.9	3134.0 $7,9^{(+)}$	3224	3239.5 7^-	3242	3259.5 $\langle \geq 9 \rangle$	3325 $\langle 1^+-7^+ \rangle$	3325.2 $\langle 17^- \rangle$
8877.0(21)	$\langle 5 \rangle$			1		1	1	1			1	
8880.9(21)	$\langle 5 \rangle$			6								
8895.6(21)	$\langle 5 \rangle$								2			
8902.5(21)	$\langle 5 \rangle$			2				4				
8912.2(21)	$\langle 5 \rangle$							1				
8927.9(21)	$\langle 5 \rangle$			6								
8942.6(21)	$\langle 5 \rangle$			2								
8965.1(21)	$\langle 5^+ \rangle$			3		2	1					
9008.2(21)	$\langle 5^+ \rangle$			4								
9029.8(21)	$\langle 5 \rangle$			3	1			4				
9044.5(21)	$\langle 7^- \rangle$									4		
9071.9(21)	$\langle 5 \rangle$			2								
9075.8(21)	$\langle 5 \rangle$			3							2	
9078.8(21)	$\langle 3^- \rangle$			3								
9094.4(21)	$\langle 5 \rangle$			4								
9118.0(21)	$\langle 5 \rangle$			7								
9154.2(21)	$\langle 5^+ \rangle$						1	2				
9161.1(21)	$\langle 1^-, 3 \rangle$						3					
9167.9(21)	$\langle 5 \rangle$			2					2			
9168.9(21)	$\langle 3^- \rangle$						2					
9174.8(21)	$\langle 5 \rangle$			5								
9195.3(21)	$\langle 5 \rangle$			3								

Energy levels and branching ratios [95Bu23]. Part 6

⁴⁹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	3342 $\langle 1^+-9^+ \rangle$	3388 $\langle 3, 5^- \rangle$	3388.5 $5, 7$	3405 $\langle 3 \rangle^-$	3462.9 $\langle 3^+-9^+ \rangle$	3516 $\langle 3^- - 9 \rangle$	3521 $\langle \leq 9 \rangle$	3531 $\langle \leq 7^- \rangle$	3531.1 $5^-, 7, 9^+$	3603
7745.0	3^-				1.9							
7750	3^-				2.0	3						
7838.7(21)	$\langle 1^- \rangle$			9								
7910.2(21)	$\langle 1^- \rangle$			7								
7943.5(21)	$\langle 3^- \rangle$				3						1	
8058.1(21)	$\langle 3, 5^+ \rangle$			2								
8104.2	$3^{(-)}, 5$			3								
8117.5	3				5.0							
8131.5(21)	$\langle 3^- \rangle$				3						4	3
8525.3(21)	$\langle 5 \rangle$											5
8633.1(21)	$\langle 5 \rangle$			2				2				
8642.9(21)	$\langle 3^-, 5 \rangle$				1							
8788.8(21)	$\langle 5^- \rangle$			3								
8851.5(21)	$\langle 5^-, 7^- \rangle$			5								

(continued)

⁴⁹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	3342 $\langle 1^+-9^+ \rangle$	3388 $\langle 3,5^- \rangle$	3388.5 5,7	3405 $\langle 3 \rangle^-$	3462.9 $\langle 3^+-9^+ \rangle$	3516 $\langle 3^--9^- \rangle$	3521 $\langle \leq 9 \rangle$	3531 $\langle \leq 7^- \rangle$	3531.1 $5^-,7,9^+$	3603
8867.2(21)	$\langle 5 \rangle$			1			1					
8877.0(21)	$\langle 5 \rangle$			1								
8880.9(21)	$\langle 5 \rangle$			3			4					
8890.7(21)	$\langle 3^- \rangle$			2								
8895.6(21)	$\langle 5 \rangle$				2							
8912.2(21)	$\langle 5 \rangle$			1								1
8925.0(21)	$\langle 7^- \rangle$			2								
8927.9(21)	$\langle 5 \rangle$			4								
8965.1(21)	$\langle 5^+ \rangle$			3								
9008.2(21)	$\langle 5^+ \rangle$		3									
9029.8(21)	$\langle 5 \rangle$			1								1
9044.5(21)	$\langle 7^- \rangle$							2				
9071.9(21)	$\langle 5 \rangle$			1					3			
9118.0(21)	$\langle 5 \rangle$			1								
9148.3(21)	$\langle 5 \rangle$									5		
9167.9(21)	$\langle 5 \rangle$			2								1
9168.9(21)	$\langle 3^- \rangle$			1								
9195.3(21)	$\langle 5 \rangle$								3			

Energy levels and branching ratios [95Bu23]. Part 7

⁴⁹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	3639.8 $\langle 7^- \rangle$	3671 $\langle 1^+-9^+ \rangle$	3678 $\langle 7 \rangle^-$	3694 $3^+,5^+$	3721 $\langle \leq 7 \rangle^-$	3741 $1^-,3^-$	3742.4 $\langle 19^- \rangle$	3757 $5^-,7^-$	3771 $\langle 1^+-9^+ \rangle$	3782 $\langle \geq 9 \rangle$
5529.7(7)	$\langle 21^- \rangle$								70			
5689.9(8)	$\langle 23^- \rangle$								97			
6844.9(8)	$\langle 23^- \rangle$								10.5			
7745.0	3^-								9			
7750	3^-								9	2.0		
7838.7(21)	$\langle 1^- \rangle$							4				
7943.5(21)	$\langle 3^- \rangle$				5							
8058.1(21)	$\langle 3,5^+ \rangle$							8				
8092.6	$\langle 1^- \rangle$								4.0			
8290.3	$3^{\langle - \rangle}$								2.1			
8640.9(21)	$\langle 3^- \rangle$		1				3		1			
8682.0(21)	$\langle 5 \rangle$		1	1								
8867.2(21)	$\langle 5 \rangle$		1					2				
8880.9(21)	$\langle 5 \rangle$					1						
8890.7(21)	$\langle 3^- \rangle$					1		3				
8893.6(21)	$\langle 5^- \rangle$		1					1				
8912.2(21)	$\langle 5 \rangle$					1						
8925.0(21)	$\langle 7^- \rangle$											2

(continued)

 $^{49}_{23}\text{V}$

E^*	$2J^\pi$	Branching ratios in percentage									
[keV]	$E_f^*:$ $2J_f^\pi:$	3639.8 $\langle 7^- \rangle$	3671 $\langle 1^+-9^+ \rangle$	3678 $\langle 7^- \rangle$	3694 $3^+, 5^+$	3721 $\langle \leq 7^- \rangle$	3741 $1^-, 3^-$	3742.4 $\langle 19^- \rangle$	3757 $5^-, 7^-$	3771 $\langle 1^+-9^+ \rangle$	3782 $\langle \geq 9 \rangle$
8942.6(21)	$\langle 5 \rangle$				3						
8965.1(21)	$\langle 5^+ \rangle$						4				
9008.2(21)	$\langle 5^+ \rangle$		3	3			3			2	
9029.8(21)	$\langle 5 \rangle$		1								
9075.8(21)	$\langle 5 \rangle$				1	1					
9094.4(21)	$\langle 5 \rangle$				2		2				
9167.9(21)	$\langle 5 \rangle$			1	1		1				
9168.9(21)	$\langle 3^- \rangle$						1				

Energy levels and branching ratios [95Bu23]. Part 8

 $^{49}_{23}\text{V}$

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		$E_f^*:$ $2J_f^\pi:$	3816 $\langle \leq 7^- \rangle$	3841	3912 $\langle 3 \rangle^-$	3927 $\langle 1^+ - 9^+ \rangle$	3960	4002 $\langle 3 \rangle^-$	4035 $\langle 3^- - 9^+ \rangle$	4088	4098 $\langle \leq 7^- \rangle$	4129 $\langle 5 \rangle^-$
7745.0	3^-		1.0		9.7			1.9		16.5		4.9
7750	3^-				6.9			9.9		9		2.0
7943.5(21)	$\langle 3^- \rangle$		1		1							
8092.6	$\langle 1^- \rangle$			4.0	3.0			3.0				
8104.2	$3^{\langle - \rangle}, 5$			6								
8117.5	3							4.0				
8290.3	$3^{\langle - \rangle}$							2.1				
8525.3(21)	$\langle 5 \rangle$						5					
8633.1(21)	$\langle 5 \rangle$						3					4
8640.9(21)	$\langle 3^- \rangle$			1	2		1	1				
8642.9(21)	$\langle 3^-, 5 \rangle$						1	2				
8851.5(21)	$\langle 5^-, 7^- \rangle$				2							2
8867.2(21)	$\langle 5 \rangle$			2	2							
8880.9(21)	$\langle 5 \rangle$		1	1	1			1				
8890.7(21)	$\langle 3^- \rangle$		1	1			1				1	
8893.6(21)	$\langle 5^- \rangle$				2							1
8912.2(21)	$\langle 5 \rangle$				2							1
8925.0(21)	$\langle 7^- \rangle$								1			
8965.1(21)	$\langle 5^+ \rangle$		2		2	2	2			1		
9008.2(21)	$\langle 5^+ \rangle$				5			3		2		
9044.5(21)	$\langle 7^- \rangle$				2		2					
9075.8(21)	$\langle 5 \rangle$				2		1					
9094.4(21)	$\langle 5 \rangle$				2							
9167.9(21)	$\langle 5 \rangle$						2		1			

Energy levels and branching ratios [95Bu23]. Part 9

⁴⁹V
₂₃

E^*	$2J^\pi$	Branching ratios in percentage									
[keV]	$E_f^*:$ $2J_f^\pi:$	4218 $\langle 3 \rangle^-$	4253 $1^-, 3^-$	4259 $\langle 3, 5, 7 \rangle$	4270	4289 $3^+, 5^+$	4359	4373 $1^-, 3^-$	4397 $5^-, 7^-$	4422	4498
7745.0	3^-										1.0
7943.5(21)	$\langle 3^- \rangle$	1	1								
8092.6	$\langle 1^- \rangle$							5.0			
8117.5	3							3.0			
8640.9(21)	$\langle 3^- \rangle$	1									
8642.9(21)	$\langle 3^-, 5 \rangle$		1	1							
8890.7(21)	$\langle 3^- \rangle$		1		2			2			
8893.6(21)	$\langle 5^- \rangle$			1					1		
8895.6(21)	$\langle 5 \rangle$			2							
8902.5(21)	$\langle 5 \rangle$					1					
8912.2(21)	$\langle 5 \rangle$								2		
8965.1(21)	$\langle 5^+ \rangle$	1	1								
9167.9(21)	$\langle 5 \rangle$						2			1	

Energy levels and branching ratios [95Bu23]. Part 10

⁴⁹V
₂₃

E^* [keV]	$2J^\pi$	Branching ratios in percentage						
		$E_f^*:$ $2J_f^\pi:$	4540	4635 $\langle 5 \rangle^-$	5529.7 $\langle 21^- \rangle$	5689.9 $\langle 23^- \rangle$	6844.9 $\langle 23^- \rangle$	7801.4 $\langle 25^- \rangle$
5689.9(8)	$\langle 23^- \rangle$				2.6			
6844.9(8)	$\langle 23^- \rangle$				5.2	84		
7745.0	3^-			3.9				
7750	3^-			2.0				
7801.4(8)	$\langle 25^- \rangle$				4.5	51	44.9	
8092.6	$\langle 1^- \rangle$			2.0				
8416.1(9)	$\langle 27^- \rangle$							69
8890.7(21)	$\langle 3^- \rangle$			2				
8925.0(21)	$\langle 7^- \rangle$			1				
9029.8(21)	$\langle 5 \rangle$		2					
9167.9(21)	$\langle 5 \rangle$			1				

Energy levels and branching ratios [95Bu09].

⁵⁰V
₂₃

E^*	J^π	L	$\sigma(\tau, p)$	$\sigma(\tau, p)$	L	C^2S''	L	C^2S	C^2S	$\sigma(\tau, \alpha)$	C^2S	$\sigma(\tau, t)$	Ref.
[keV]		(τ, p)	$\mu b/sr$	$\mu b/sr$		(τ, d)		(p, d)	(d, t)	$\mu b/sr$	(τ, α)	μb	
0.0	6^+				3	0.92	3	1.09	1.6	1817	2.1	46(16)	73So12
226.2(2)	5^+				1	0.035	3	0.46	0.007	745	0.76		73So12
					+3	+0.37	+1	$\langle 0.02 \rangle$	0.69				73So12

(continued)

⁵⁰V
₂₃

E^*	J^π	L	$\sigma(\tau, p)$	$\sigma(\tau, p)$	L	C^2S''	L	C^2S	C^2S	$\sigma(\tau, \alpha)$	C^2S	$\sigma(\tau, t)$	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(τ, d)		(p, d)	(d, t)	$\mu\text{b/sr}$	(τ, α)	μb	
320.2(2)	4 ⁺				3	0.53	3	0.60	1.0	1520	1.40	113(28)	73So12
							+1	$\langle 0.03 \rangle$	0.007				73So12
355.4(3)	3 ⁺				3	0.52	3	0.40	0.58	498	0.56	incl	73So12
388.4(4)	2 ⁺				1	0.0096	3	0.24	0.33	392	0.39	74(25)	73So12
					+3	+0.39							73So12
836.3(4)	5 ⁺				1	0.014	3	0.64	0.013	1196	1.00		73So12
					+3	+0.25			+1.1				73So12
910.0(4)	$\langle 7 \rangle^+$	5			3	1.4	3	1.72	2.7	3227	2.43	147(26)	73So12
910.1(4)	4 ⁺	incl				incl		incl		incl			73So12
1301.4(4)	2 ⁺	6			1	0.0066	3	0.21	0.34			108(20)	73So12
					+3	+0.15							73So12
1331.5(6)	1 ⁺	0+2	145	86(12)	3	0.14	3	0.13	0.25	726	0.70		73So12
1401.9(4)	3 ⁺	2	63				1	0.012	0.012				71De10
1495.3(5)	1 ⁺	0+2	104	66(10)	3	0.020	3	0.02					73So12
1518.4(4)	2 ⁺	2	35				3	0.04		47	0.05		71De10
1561.7(4)	2 ⁺	2	21				0	0.05			0.05		75Ma06
1677.2(4)	1 ⁺ -3 ⁺						3	0.01					71De10
							+1	+0.001					
1700.2(11)	3 ⁺ -5 ⁺	4	18										72Ca32
1703.1(21)			incl				3+1	0.07+0.01					71De10
1718.9(15)	1 ⁺ -4 ⁺									41	0.04		
1724.6(4)	$\langle 8 \rangle^+$	8					3	0.04					71De10
1725.2(21)	$\langle 3^+-6^+ \rangle$	incl											
1751.5(5)	3 ⁺ -5 ⁺				1	0.008							73So12
1761.5(6)							$\langle 3+1 \rangle$	0.01+0.01		130	0.13		71De10
1762.3(11)							3	0.09		incl			71De10
							+ $\langle 1 \rangle$	+0.004					
1810.8(10)	2 ⁺ , 3 ⁺				3	0.027	$\langle 3 \rangle$	$\langle 0.10 \rangle$		90	0.10	192(50)	71De10
1882.4(9)	4 ⁺ -6 ⁺												
1936(3)	X ⁺	2					3	0.10		169	0.20		71De10
1954(3)	0 ⁺ , 1 ⁺				0	0.026	3	0.27		210	0.24		73So12
1984										226	0.20		
2038(10)	3 ⁻ , 4 ⁻												
2038(4)	3 ⁺ -5 ⁺				0	0.005							73So12
2111(3)	2 ⁺ , 3 ⁺				1	0.022	3+1	0.11+0.03					73So12
2133(7)	3 ⁺ -5 ⁺	4	20		1	0.006	$\langle 1 \rangle$	$\langle 0.10 \rangle$		142	0.10		73So12
2162(4)	3 ⁻ , 4 ⁻				0	0.005	0	0.1		35	0.1		73So12
2308(10)	2 ⁺ -5 ⁺				1	0.07							73So12
2312.6(11)							3	0.25		437			71De10
2344(4)	$\langle 2, 3 \rangle^+$	2	11		1	0.28	1+ $\langle 3 \rangle$	0.01+0.03			0.30		73So12
2399							0	0.06		30	0.06		75Ma06
2424(4)	3 ⁻ , 4 ⁻			53(8)	0	0.22							73Sm02
2425(6)	0 ⁺ , 1 ⁺	0+2	105				0	0.34					71De10
2455(4)	3 ⁺ -5 ⁺		7		1	0.20	3	0.03		27.7	0.51		73So12
2478.3(7)	$\langle 9^+ \rangle$		4										

(continued)

⁵⁰₂₃V

E^*	J^π	L	$\sigma(\tau, p)$	$\sigma(\tau, p)$	L	$C^2 S''$	L	$C^2 S$	$C^2 S$	$\sigma(\tau, \alpha)$	$C^2 S$	$\sigma(\tau, t)$	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(τ, d)		(p, d)	(d, t)	$\mu\text{b/sr}$	(τ, α)	μb	
2483	X ⁺				3	0.17	3	0.05		30.9	0.03		73So12
2492(7)	X ⁺						3	0.01					71De10
2510(5)	3 ⁻ , 4 ⁻						0	0.30		101	0.26		71De10
2534(5)	3 ⁻ , 4 ⁻		6		0	0.17	$\langle 2 \rangle$	$\langle 0.35 \rangle$		234	0.35		73Sm02
2596(5)	3 ⁻ , 4 ⁻						0	0.10		64	0.10		75Ma06
2647(8)	2 ⁺ -5 ⁺				1	0.073	3+1	0.06+0.01		89	0.05		73So12
2735(5)							2	0.20		139	0.20		75Ma06
2763(6)							0	0.10		74.6	0.10		75Ma06
2791(4)	1 ⁺ -3 ⁺		5				$\langle 3 \rangle$	$\langle 0.21 \rangle$		27.0			71De10
2816(6)	0 ⁺ , 1 ⁺	0+2	260	122(22)	1	0.011	$\langle 3+1 \rangle$	0.01+0.05			0.30		73So12
2828(9)													
2850(6)	$\langle 5^+-7^+ \rangle$												
2878(8)	2 ⁻ -4 ⁻						0	0.04		17.7	0.04		75Ma06
2893										229	0.40		
2931(8)	X ⁽⁺⁾				3	0.036	$\langle 3 \rangle$	$\langle 0.06 \rangle$					73So12
2958(9)							2	0.22		117	0.22		75Ma06
2965(9)					1	0.1							70Bi07
					+3	+0.4							
2990(5)	1 ⁺ -3 ⁺		17		1	0.024	3	0.09					73So12
3011(8)	X ⁺		10				3	0.03		111	0.12		71De10
3099(8)	X ⁻		22				2	0.4		325	0.40		73Sm02
3111(8)	2 ⁺ -5 ⁺				1	0.02							70Bi07
3136(6)	3 ⁺	2+4	39		1	0.071							73So12
3169	3 ⁻ , 4 ⁻	2	25				0	0.10		72.1	1.30		75Ma06
3177(11)	1 ⁺ -3 ⁺												
3202(8)	3 ⁻ , 4 ⁻									1124			
3220(6)	$\langle 0 \rangle^+$	0+2	358	102(22)			2	1.3					73Sm02
3221	X ⁻												
3274(8)	2 ⁺ -5 ⁺			24(5)	1	0.041							74Ha55
3293(6)	2 ⁺ -5 ⁺	4	13		1	0.31	3	0.4					73So12
3312(7)							3	incl		459	0.40		
3402(15)			8										72Ca32
3433(8)					1	0.001							73So12
3462(5)	$\langle 0 \rangle^+$			260(35)									74Ha55
3482(8)	0 ⁺ , 1 ⁺	0+2	548				3	0.2			0.23		73Sm02
3537(10)	2 ⁺ -5 ⁺		6		1	0.060				324	0.04		73So12
3542	X ⁻						2	0.04		32.3	0.04		75Ma06
3556(7)	0 ⁺ , 1 ⁺	0	244	118(17)									74Ha55
3564(7)	X ⁻						2	0.04		29.1	0.20		75Ma06
3606(10)	X ⁻				2	0.023				214			73So12
3608	X ⁺		18				3	0.20					75Ma06
3671(5)	2 ⁺ , 3 ⁺	2	40		1	0.0056							73So12
3700(5)	2 ⁺ , 3 ⁺	2	19		1	0.018	3	0.03		32.2	0.03		73So12
3722(5)	0 ⁺ , 1 ⁺				3	0.056	3	0.60		634	0.60		73So12
3729.4(9)	$\langle 10^+ \rangle$												

(continued)

⁵⁰₂₃V

E^*	J^π	L	$\sigma(\tau, p)$	$\sigma(\tau, p)$	L	C^2S''	L	C^2S	C^2S	$\sigma(\tau, \alpha)$	C^2S	$\sigma(\tau, t)$	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$		(τ, d)		(p, d)	(d, t)	$\mu\text{b/sr}$	(τ, α)	μb	
3755	$3^-, 4^-$						0	0.11		67.4	0.11		75Ma06
3755	$0^+, 1^+$												
3769(15)			21										72Ca32
3798(10)			38										72Ca32
3811(10)	$2^+ - 5^+$				1	0.063	3	0.30		287	0.30		73So12
3840(10)													
3878(10)	$2^+ - 5^+$		50		1	0.033	3	0.05		52.6	0.05		73So12
3914(10)	$2^+ - 5^+$				1	0.01							73Sm02
3940(9)	$3^-, 4^-$				0	0.0014							73So12
3956(10)	$2^+, 3^+$	2	44		1	0.013							73So12
4040	X^-						2	0.09		102	0.09		75Ma06
4072(9)	$2^+ - 5^+$		22		1	0.029	3	0.10		95	0.10		73So12
4120(9)	X^+		18				3	0.20		165	0.20		75Ma06
4146(9)	$2^+, 3^+$	2	90		1	0.077							73So12
4195(10)													
4213(10)													
4234(10)													
4266(7)	$2^+ - 4^+$		138		1	0.12	1	0.06		116	0.06		70Bi07
4292.3(10)	$\langle 11^+ \rangle$												
4294(10)					1	0.12							70Bi07
4334(15)	X^-		22				2	0.07		88	0.07		75Ma06
4396(10)	$2^+ - 5^+$				1	0.05	1	0.06		118	0.06		70Bi07
4430(9)	$2^+ - 5^+$	0+2	173	90(15)	1	0.06	3	0.05		40.3	0.05		74Ha55
4480	X^-						2	0.04		46.5	0.16		75Ma06
4501(9)			12				2	0.16					75Ma06
4541(9)			15							190	0.16		72Ca32
4570(9)	$3^-, 4^-$		24				0	0.20		162	0.20		75Ma06
4599(9)	$\langle 2, 3 \rangle^+$	2	28				1	0.04		101	0.04		75Ma06
4653(9)	$2^+ - 5^+$		15		1	0.11				106	0.09		70Bi07
4704(15)	X^-		18				2	0.09					75Ma06
4722(15)	$0^+, 1^+$	0+2	133	53(8)									74Ha55
4774(15)	$2^+ - 5^+$				1	0.11							70Bi07
4780	X^-						2	0.10		161	0.10		75Ma06
4809(6)*	$\langle 0 \rangle^+$	0	353	210(31)						385	0.43		74Ha55
4833(15)	$2^+ - 5^+$				1	0.12	3	0.43					70Bi07
4864(15)	$3^-, 4^-$		27				0	0.09		549	0.09		75Ma06
4904(11)	$1^+ - 3^+$	2	31				3	0.09		93.6	0.09		75Ma06
4943(15)			54										72Ca32
5026(11)			37										72Ca32
5060(11)	$2^+ - 5^+$		16				1	0.03		143	0.03		75Ma06
5090(15)	$2^+ - 5^+$				1	0.08	3	0.06		50.8	0.06		70Bi07
5123(15)			22										72Ca32
5172(15)	$0^+, 1^+$	0+2	55										72Ca32
5264(15)			31										72Ca32
5288(15)			39										72Ca32

(continued)

⁵⁰₂₃V

E^*	J^π	L	$\sigma(\tau, p)$	$\sigma(\tau, p)$	L	C^2S''	L	C^2S	C^2S	$\sigma(\tau, \alpha)$	C^2S	$\sigma(\tau, t)$	Ref.
[keV]		(τ, p)	$\mu b/sr$	$\mu b/sr$		(τ, d)		(p, d)	(d, t)	$\mu b/sr$	(τ, α)	μb	
5320(11)			49										72Ca32
5352(15)			109										72Ca32
5405(11)			22										72Ca32
5440	$2^+ - 5^+$						1	0.06		166	0.06		75Ma06
5491(15)	$0^+, 1^+$	0+2	161				3	0.10		76.8	0.10		75Ma06
5542(11)	$1^+ - 3^+$	2	37										72Ca32
5664(18)			29										72Ca32
5752(11)	$0^+, 1^+$	0+2	117	51(9)									74Ha55
5782(11)	$1^+ - 3^+$	2	30										72Ca32
5829(11)			29										72Ca32
5882(11)			24										72Ca32
5899(15)			59										72Ca32
5948(11)	$2^+, 3^+$	2	39		1	0.06							70Bi07
6080(15)			24										72Ca32
6124(15)			87										72Ca32
6179(15)	$\langle 1^+ - 3^+ \rangle$	2	66										72Ca32
6222(15)			50										72Ca32
6267(15)	$\langle 1^+ - 3^+ \rangle$	2	43										72Ca32
6341(15)			83										72Ca32
6395(15)	$\langle 2 \rangle^+$		103				3	0.20		148	0.20		75Ma06
6464(15)			97										72Ca32
6558(15)			53										72Ca32
6601(15)			42										72Ca32
6652(15)			41										72Ca32
6685(15)			22										72Ca32
6744(15)			30										72Ca32
6804(15)			27										72Ca32
6833(15)			92										72Ca32
6883(15)			77										72Ca32
6929(15)			28										72Ca32
6969(15)			25										72Ca32
6989(15)			153										72Ca32
7092(15)			63										72Ca32
7106(15)			70										72Ca32
7173(15)			65										72Ca32
7206(15)			79										72Ca32
7321(15)			72										72Ca32
7386(15)			58										72Ca32
7442(15)			151										72Ca32
7520(20)	$\langle 4 \rangle^+$						3	0.38		214	0.38		75Ma06
8050(20)	$\langle 6 \rangle^+$						3	0.70		373	0.70		75Ma06
8583(15)*	$\langle 0 \rangle^+$		573	194(27)									74Ha55
9115													
9164													
9270(20)	$\langle 3 \rangle^-$						0	0.30		235	0.30		75Ma06

(continued)

**⁵⁰V
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E^*	J^π	L	$\sigma(\tau, p)$	$\sigma(\tau, p)$	L	C^2S''	L	C^2S	C^2S	$\sigma(\tau, \alpha)$	C^2S	$\sigma(\tau, t)$	Ref.
[keV]		(τ, p)	$\mu b/sr$	$\mu b/sr$		(τ, d)		(p, d)	(d, t)	$\mu b/sr$	(τ, α)	μb	
10240(20)	$X^{(-)}$												78Oh01
10640(20)	$X^{(-)}$												78Oh01
10900(20)	$3^-, 4^-$												78Oh01
11270(20)	$X^{(-)}$												78Oh01
11440(20)	$X^{(-)}$												78Oh01
12570(20)													78Oh01
		72Ca32	72Ca32	74Ha55		73So12		75Ma06	73So12	75Ma06	75Ma06	69Br04	Ref.

Additional data on this isotope can be found in [78Oh01, 77Cl01, 70Au04].

Abundance: 0.250(2) %.

* Antianalog and analog states [74Ha55].

Discrepancies between C^2S in the neutron pickup reactions [71De10, 73Sm02, 75Ma06] as well as positions of few analog states in $^{50}\text{V} - ^{50}\text{Ti}$ [78Oh01] are discussed in [95Bu09].For the (τ, α) reaction σ and C^2S are interconnected by $\sigma_{exp} = NC^2S(2J+1)(2j+1)^{-1}\sigma_{DWBA}$ where j is the total angular momentum of the transferred neutron and $N=23$ [75Ma06].

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

Energy levels and branching ratios [95Bu09]. Part 2

**⁵⁰V
₂₃**

E^*	J^π	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		Γ_{cm}		E_f^* : J_f^π :	0.0 6 ⁺	226 5 ⁺	320 4 ⁺	355 3 ⁺	388 2 ⁺	836 5 ⁺	910 <7> ⁺
0.0	6 ⁺	1.4(4)·10 ¹⁷ yr	73So12								
226.2(2)	5 ⁺	<3.7 ps	73So12		100						
			73So12								
320.2(2)	4 ⁺	56(12) ps	73So12		1.5(2)	98.5(2)					
			73So12								
355.4(3)	3 ⁺	<3 ns	73So12			0.70(2)	99.30				
388.4(4)	2 ⁺		73So12					100			
			73So12								
836.3(4)	5 ⁺	54(22) fs	73So12		51		49				
			73So12								
910.0(4)	<7> ⁺	43(8) fs	73So12		100						
910.1(4)	4 ⁺	68(8) fs	73So12			100					
1301.4(4)	2 ⁺	48(5) fs	73So12					33(4)	67(4)		
			73So12								
1331.5(6)	1 ⁺	17(6) fs	73So12						100		
1401.9(4)	3 ⁺	>0.8 ps	71De10				14(5)	16(7)	58(3)		12(4)
1495.3(5)	1 ⁺	44(7) fs	73So12					12(5)	88(5)		
1518.4(4)	2 ⁺	164(26) fs	71De10					18(3)	82(2)		
1561.7(4)	2 ⁺	0.7(+4-2) ps	75Ma06					51(2)	49(2)		
1677.2(4)	1 ⁺ -3 ⁺	>0.3 ps	71De10					20	15		

(continued)

**⁵⁰V
²³**

E^* [keV]	J^π	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage							
				E_f^* : J_f^π :	0.0 6 ⁺	226 5 ⁺	320 4 ⁺	355 3 ⁺	388 2 ⁺	836 5 ⁺	910 <7> ⁺
1700.2(11)	3 ⁺ -5 ⁺	0.35(10) ps	72Ca32				x				
1703.1(21)			71De10								
1718.9(15)	1 ⁺ -4 ⁺							44(11)	56(11)		
1724.6(4)	<8> ⁺	0.14(6) ps	71De10		36(1)						64(1)
1725.2(21)	<3 ⁺ -6 ⁺ >					91(5)	9(5)				
1751.5(5)	3 ⁺ -5 ⁺	>1.3 ps	73So12			x	x	x			
1761.5(6)		<5 fs	71De10		x						
1762.3(11)			71De10							x	
1810.8(10)	2 ⁺ ,3 ⁺	>2.9 ps	71De10				x	x	x		
1882.4(9)	4 ⁺ -6 ⁺	15(8) fs								x	
1936(3)	X ⁺		71De10								
1954(3)	0 ⁺ ,1 ⁺		73So12								
1984											
2038(10)	3 ⁻ ,4 ⁻										
2038(4)	3 ⁺ -5 ⁺		73So12								
2111(3)	2 ⁺ ,3 ⁺		73So12								
2133(7)	3 ⁺ -5 ⁺		73So12								
2162(4)	3 ⁻ ,4 ⁻		73So12								
2308(10)	2 ⁺ -5 ⁺		73So12								
2312.6(11)			71De10								
2344(4)	<2,3> ⁺		73So12								
2399			75Ma06								
2424(4)	3 ⁻ ,4 ⁻		73Sm02								
2425(6)	0 ⁺ ,1 ⁺		71De10						100		
2455(4)	3 ⁺ -5 ⁺		73So12								
2478.3(7)	<9 ⁺ >	0.24(+28-14) ps									
2483	X ⁺		73So12								
2492(7)	X ⁺		71De10								
2510(5)	3 ⁻ ,4 ⁻		71De10								
2534(5)	3 ⁻ ,4 ⁻		73Sm02								
2596(5)	3 ⁻ ,4 ⁻		75Ma06								
2647(8)	2 ⁺ -5 ⁺		73So12								
2735(5)			75Ma06								
2763(6)			75Ma06								
2791(4)	1 ⁺ -3 ⁺		71De10								
2816(6)	0 ⁺ ,1 ⁺		73So12								
2828(9)											
2850(6)	<5 ⁺ -7 ⁺ >										
2878(8)	2 ⁻ -4 ⁻		75Ma06								
2893											
2931(8)	X⁺		73So12								
2958(9)			75Ma06								
2965(9)			70Bi07								

(continued)

⁵⁰V
₂₃

E^*	J^π	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		Γ_{cm}		E_f^* : J_f^π :	0.0 6 ⁺	226 5 ⁺	320 4 ⁺	355 3 ⁺	388 2 ⁺	836 5 ⁺	910 (7) ⁺
2990(5)	1 ⁺ –3 ⁺		73So12								
3011(8)	X ⁺		71De10								
3099(8)	X [–]		73Sm02								
3111(8)	2 ⁺ –5 ⁺		70Bi07								
3136(6)	3 ⁺		73So12								
3169	3 [–] , 4 [–]		75Ma06								
3177(11)	1 ⁺ –3 ⁺										
3202(8)	3 [–] , 4 [–]										
3220(6)	(0) ⁺		73Sm02								
3221	X [–]										
3274(8)	2 ⁺ –5 ⁺		74Ha55								
3293(6)	2 ⁺ –5 ⁺		73So12								
3312(7)											
3402(15)			72Ca32								
3433(8)			73So12								
3462(5)	(0) ⁺		74Ha55						15		
3482(8)	0 ⁺ , 1 ⁺		73Sm02								
3537(10)	2 ⁺ –5 ⁺		73So12								
3542	X [–]		75Ma06								
3556(7)	0 ⁺ , 1 ⁺		74Ha55								
3564(7)	X [–]		75Ma06								
3606(10)	X [–]		73So12								
3608	X ⁺		75Ma06								
3671(5)	2 ⁺ , 3 ⁺		73So12								
3700(5)	2 ⁺ , 3 ⁺		73So12								
3722(5)	0 ⁺ , 1 ⁺		73So12								
3729.4(9)	(10 ⁺)	28(+56-28) fs									
3755	3 [–] , 4 [–]		75Ma06								
3755	0 ⁺ , 1 ⁺										
3769(15)			72Ca32								
3798(10)			72Ca32								
3811(10)	2 ⁺ –5 ⁺		73So12								
3840(10)											
3878(10)	2 ⁺ –5 ⁺		73So12								
3914(10)	2 ⁺ –5 ⁺		73Sm02								
3940(9)	3 [–] , 4 [–]		73So12								
3956(10)	2 ⁺ , 3 ⁺		73So12								
4040	X [–]		75Ma06								
4072(9)	2 ⁺ –5 ⁺		73So12								
4120(9)	X ⁺		75Ma06								
4146(9)	2 ⁺ , 3 ⁺		73So12								
4195(10)											
4213(10)											
4234(10)											
4266(7)	2 ⁺ –4 ⁺		70Bi07								

(continued)

⁵⁰V
₂₃

E^*	J^π	$T_{1/2}$ or	Ref.	Branching ratios in percentage							
[keV]		Γ_{cm}		E_f^* :	0.0	226	320	355	388	836	910
				J_f^π :	6 ⁺	5 ⁺	4 ⁺	3 ⁺	2 ⁺	5 ⁺	$\langle 7 \rangle^+$
4292.3(10)	$\langle 11^+ \rangle$	0.24(7) ps									
4294(10)			70Bi07								
4334(15)	X ⁻		75Ma06								
4396(10)	2 ⁺ -5 ⁺		70Bi07								
4430(9)	2 ⁺ -5 ⁺		74Ha55								
4480	X ⁻		75Ma06								
4501(9)			75Ma06								
4541(9)			72Ca32								
4570(9)	3 ⁻ ,4 ⁻		75Ma06								
4599(9)	$\langle 2,3 \rangle^+$		75Ma06								
4653(9)	2 ⁺ -5 ⁺		70Bi07								
4704(15)	X ⁻		75Ma06								
4722(15)	0 ⁺ ,1 ⁺		74Ha55								
4774(15)	2 ⁺ -5 ⁺		70Bi07								
4780	X ⁻		75Ma06								
4809(6)*	$\langle 0 \rangle^+$		74Ha55								
4833(15)	2 ⁺ -5 ⁺		70Bi07								
4864(15)	3 ⁻ ,4 ⁻		75Ma06								
4904(11)	1 ⁺ -3 ⁺		75Ma06								
4943(15)			72Ca32								
5026(11)			72Ca32								
5060(11)	2 ⁺ -5 ⁺		75Ma06								
5090(15)	2 ⁺ -5 ⁺		70Bi07								
5123(15)			72Ca32								
5172(15)	0 ⁺ ,1 ⁺		72Ca32								
5264(15)			72Ca32								
5288(15)			72Ca32								
5320(11)			72Ca32								
5352(15)			72Ca32								
5405(11)			72Ca32								
5440	2 ⁺ -5 ⁺		75Ma06								
5491(15)	0 ⁺ ,1 ⁺		75Ma06								
5542(11)	1 ⁺ -3 ⁺		72Ca32								
5664(18)			72Ca32								
5752(11)	0 ⁺ ,1 ⁺		74Ha55								
5782(11)	1 ⁺ -3 ⁺		72Ca32								
5829(11)			72Ca32								
5882(11)			72Ca32								
5899(15)			72Ca32								
5948(11)	2 ⁺ ,3 ⁺		70Bi07								
6080(15)			72Ca32								
6124(15)			72Ca32								
6179(15)	$\langle 1^+-3^+ \rangle$		72Ca32								
6222(15)			72Ca32								
6267(15)	$\langle 1^+-3^+ \rangle$		72Ca32								

(continued)

⁵⁰V
₂₃

E^* [keV]	J^π	$T_{1/2}$ or Γ_{cm}	Ref.	Branching ratios in percentage							
				E_f^* : J_f^π :	0.0 6 ⁺	226 5 ⁺	320 4 ⁺	355 3 ⁺	388 2 ⁺	836 5 ⁺	910 $\langle 7 \rangle^+$
6341(15)			72Ca32								
6395(15)	$\langle 2 \rangle^+$		75Ma06								
6464(15)			72Ca32								
6558(15)			72Ca32								
6601(15)			72Ca32								
6652(15)			72Ca32								
6685(15)			72Ca32								
6744(15)			72Ca32								
6804(15)			72Ca32								
6833(15)			72Ca32								
6883(15)			72Ca32								
6929(15)			72Ca32								
6969(15)			72Ca32								
6989(15)			72Ca32								
7092(15)			72Ca32								
7106(15)			72Ca32								
7173(15)			72Ca32								
7206(15)			72Ca32								
7321(15)			72Ca32								
7386(15)			72Ca32								
7442(15)			72Ca32								
7520(20)	$\langle 4 \rangle^+$		75Ma06								
8050(20)	$\langle 6 \rangle^+$		75Ma06								
8583(15)*	$\langle 0 \rangle^+$		74Ha55								
9115											
9164											
9270(20)	$\langle 3 \rangle^-$		75Ma06								
10240(20)	$X^{(-)}$		78Oh01								
10640(20)	$X^{(-)}$		78Oh01								
10900(20)	3 ⁻ , 4 ⁻		78Oh01								
11270(20)	$X^{(-)}$		78Oh01								
11440(20)	$X^{(-)}$		78Oh01								
12570(20)			78Oh01								
			Ref.								

Energy levels and branching ratios [95Bu09]. Part 3

⁵⁰V
₂₃

E^* [keV]	J^π	Branching ratios in percentage									
		E_f^* : J_f^π :	910 4 ⁺	1301 2 ⁺	1331 1 ⁺	1402 3 ⁺	1495 1 ⁺	1518 2 ⁺	1724.6 $\langle 8 \rangle^+$	2478.3 $\langle 9^+ \rangle$	3729.4 $\langle 10^+ \rangle$
1677.2(4)	1 ⁺ -3 ⁺			54		11					
1703.1(21)			x								

(continued)

⁵⁰V
₂₃

E^* [keV]	J^π	Branching ratios in percentage									
		E_f^* : J_f^π :	910 4 ⁺	1301 2 ⁺	1331 1 ⁺	1402 3 ⁺	1495 1 ⁺	1518 2 ⁺	1724.6 $\langle 8 \rangle^+$	2478.3 $\langle 9^+ \rangle$	3729.4 $\langle 10^+ \rangle$
1761.5(6)			x								
1810.8(10)	2 ⁺ , 3 ⁺			x							
2312.6(11)									x		
2478.3(7)	$\langle 9^+ \rangle$								100		
2816(6)	0 ⁺ , 1 ⁺			60	40						
2850(6)	$\langle 5^+ - 7^+ \rangle$	x									
3177(11)	1 ⁺ - 3 ⁺						100				
3220(6)	$\langle 0 \rangle^+$						100				
3462(5)	$\langle 0 \rangle^+$			30			30	25			
3556(7)	0 ⁺ , 1 ⁺				50		50				
3729.4(9)	$\langle 10^+ \rangle$									100	
4266(7)	2 ⁺ - 4 ⁺							100			
4292.3(10)	$\langle 11^+ \rangle$										100
4809(6)*	$\langle 0 \rangle^+$				100						
8583(15)*	$\langle 0 \rangle^+$						100				

Energy levels and branching ratios [97Zh09].

⁵¹V
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E^* [keV]	$2J^\pi$	L	C^2S'	$\sigma(\tau, d)$ $\mu\text{b/sr}$	C^2S'	$\sigma(\tau, d)$ $\mu\text{b/sr}$	C^2S	$\sigma(\tau, d)$ $\mu\text{b/sr}$	$\sigma(\alpha, p)$ $\mu\text{b/sr}$	L	L	S''	βR	Ref.
		(τ, d)	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(α, p)		(d, p)	(p, p')	
0.0	7 ⁻	3	7.2	3220	5.6	770	0.75		36	3	3	0.71		69Pu02
320.083(1)	5 ⁻					20					3	0.28	0.36	67De02
928.66(7)	3 ⁻	1	0.05	340	0.05	100	0.008	500					0.22	69Pu02
1609.23(2)	11 ⁻										1	0.05	0.39	67De02
1813.24(2)	9 ⁻										1	0.07	0.30	67De02
2410.8(1)	3 ⁻	1	2.6	21800	1.7	2800	0.57	4600	67	1			0.19	69Pu02
2547.4(6)	1 ⁺	0	0.17	1970	0.06	220	0.0032	100						69Pu02
2677.4(1)	$\langle 3 \rangle^+$	2	0.21	190	0.06	30								68Ne03
2699.6(1)	15 ⁻												0.21	70Pr08
2790(8)														
3083.6(1)	$\langle 5 \rangle^-$	3	1.0	690	0.75	210					$\langle 3 \rangle$	0.04	0.03	69Pu02
3150	$\langle 3^- \rangle$								24	$\langle 1 \rangle$				70Gi10
3214.8(5)	3 ⁻	1	0.7	7310	0.52	1400	1.2	1200						69Pu02
3264.0(2)	$\langle 5 \rangle^-$												0.04	69Pe02
3280.0(3)	$\langle 5 \rangle$													
3310														
3320	X ⁻													
3372(10)	1 ⁻ , 3 ⁻	1	0.02	250							1	1.09	0.22	69Pu02
3377.7(1)	9 ⁻													99Ka65
3381.1(10)	$\langle 3, 5 \rangle^-$													
3383.2(6)	$\langle 9, 11^- \rangle$													

(continued)

⁵¹V
₂₃

E^*	$2J^\pi$	L	C^2S'	$\sigma(\tau, d)$	C^2S'	$\sigma(\tau, d)$	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, p)$	L	L	S''	βR	Ref.
[keV]		(τ, d)	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(α, p)		(d, p)	(p, p')	
3385.6(1)	13 ⁻													
3395.0(1)	$\langle 13 \rangle^-$													
3412.2(8)														
3443.9(2)	$\langle 1-7^- \rangle$										1	0.005	0.22	67De02
3454.1(2)	9 ⁻													99Ka65
3517.0(1)	9 ⁻										1	0.008	0.20	67De02
3555(1)														
3562.2(3)	$\langle 3^- - 7^- \rangle$													99Ka65
3568(1)	$\langle 1^- - 7^- \rangle$													
3576.6(2)	$\langle 3^- - 7^- \rangle$													99Ka65
3614.0(2)	9 ⁻ , 11 ⁻										1	0.57		67De02
3623.7(5)														
3632	3 ⁺ , 5 ⁺													67Gl09
3632.0(2)	3 ⁻ - 7 ⁻												0.07	69Pe02
3663.6(10)	3 ⁻													69Pu02
3668														
3678.9(3)	3 ⁻	1	0.05	470	0.04	130	0.035	360						99Ka65
3683														
3722.7(3)														
3743(8)	1 ⁺													67Gl09
3748														
3765.2(11)														
3779.5(4)	5 ⁺ , 7 ⁺												0.34	70Pr08
3796.5(3)	3 ⁻ - 7 ⁻										1	0.04	0.05	67De02
3803.6(1)	9 ⁻ , 11 ⁻													
3840														
3872.1(5)											1	0.75		67De02
3873.7(1)	15 ⁻													
3874														
3902.3(1)	9 ⁺ , 11 ⁺												0.06	69Pe02
3919.5(1)	9 ⁻										1	0.19	0.22	67De02
3939(8)	X ⁺												0.09	69Pe02
3943.3(1)	$\langle 9 \rangle^-$													
4002.5(1)	7 ⁺ , 9 ⁻													99Ka65
4025.3(2)	$\langle 5^- , 7^- \rangle$													
4030														
4052.5(5)	X ^{$\langle - \rangle$}												0.046	69Pe02
4124.0(1)	9 ⁻ , 11 ⁻										1	0.14	0.076	67De02
4180	$\langle 1 \rangle^-$								20	1				70Gi10
4205	3 ⁺ , 5 ⁺													67Gl09
4224.8(1)	9 ⁻ , 11 ⁻										1	0.002		67De02
											+3	0.07		65Ca09
4237.4(6)	1 ⁻ , 3 ⁻	1			0.03	120	0.25	1100						67Ob04
4265.2(11)	$\langle 1 \rangle^-$	1	0.5	5410	0.25	870								69Pu02
4323.0(2)														99Ka65

(continued)

⁵¹V
₂₃

E^*	$2J^\pi$	L	C^2S'	$\sigma(\tau, d)$	C^2S'	$\sigma(\tau, d)$	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, p)$	L	L	S''	βR	Ref.
[keV]		(τ, d)	(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	$\mu b/sr$	(α, p)		(d, p)	(p, p')	
4450.7(2)	$\langle 3^-, 5^- \rangle$	3	0.06	310	0.14	50	0.004	160			1	0.41		67Ob04
4446.7(1)	$9^-, 11^-$													
4463.8(2)														99Ka65
4474.8(11)	$3^-, 7^-$										1	0.06		67De02
4493.9(1)	$11^-, 13^-$													
4505	1^+													67Gl09
4512(10)	X^+												0.22	70Pr08
4521(15)	$5^-, 7^-$	3	0.3	250	0.22	90								69Pu02
4539.8(11)	$\langle 3 \rangle^-$													
4558.9(5)														99Ka65
4560.5(1)	$9^-, 11^-$										1	0.02		67De02
4582.8(1)	9^-										1	0.04		67De02
4633(15)	$5^-, 7^-$	3	0.4	340	0.30	100								69Pu02
4651.2(6)														
4660.8(5)														
4670	$X^{(-)}$												0.039	69Pe02
4680														
4689(1)													0.055	69Pe02
4755(15)	$\langle 5^-, 7^- \rangle$	3	[0.2]	1280	0.89	270								67Ob04
4768.5(3)	5^-										1	0.04		67De02
4775.4(3)	$9^-, 11^-$											incl		67De02
4790	X^-													
4800											[3]	0.17		67De02
4820.8(1)	17^-													
4838.3(15)	$9^-, 11^-$													99Ka65
4843.4(3)	3^-	1	0.3	2690	0.18	570	0.186	850			1	0.006		67De02
											+3	0.08		65Ca09
4849(15)	$1^-, 3^-$	1		incl										69Pu02
4864.7(6)	3^-										1	0.07		67De02
4885.3(3)														99Ka65
4894.2(1)	$11^-, 15^-$													
4907	1^+													67Gl09
4916.1(1)	$\langle 9-13 \rangle^-$													
4936.1(6)	$X^{(-)}$													99Ka65
4943.9(6)														
4949.5(5)														99Ka65
4977.7(5)	$1^-, 3^-$	1	0.5	4940	0.24	880	0.263	1000						69Pu02
5019.9(1)	$9^-, 13^-$													
5030.2(1)	$9^-, 13^-$													
5037(10)	X^-										1	0.12		67De02
5069.8(3)	$3^+, 5^+$													99Ka65
5080.2(4)	X^-													99Ka65
5104(15)	1^+	0			0.01	110								67Ob04
5113.3(1)	$11^-, 13^-$													
5127(15)	$3^+, 5^+$	2	0.2	1060	0.06	170	0.35	580						69Pu02

(continued)

⁵¹₂₃V

E^*	$2J^\pi$	L	C^2S'	$\sigma(\tau, d)$	C^2S'	$\sigma(\tau, d)$	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, p)$	L	L	S''	βR	Ref.
[keV]		(τ, d)	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	(τ, d)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(α, p)		(d, p)	(p, p')	
5137.5(3)														99Ka65
5142(15)	$9^- - 15^-$													
5160(15)	$9^- - 15^-$													
5181.8(6)	$3^+, 5^+$	2	0.04		0.04	120								67Ob04
5188.4(1)	$11^- - 15^-$													
5208.5(1)	$9^-, 11^-$													99Ka65
5249.0(5)														99Ka65
5256.0(1)	$11^- - 15^-$													
5292.3(5)														99Ka65
5308.1(1)	9^-													
5311.2(5)	$\langle 3^-, 5^- \rangle$											0.048		69Pe02
5325.4(1)	$9^-, 11^-$													99Ka65
5333.3(1)	$9^- - 13^-$													
5341.3(7)	$1^-, 3^-$	1	0.04	500	0.02	70								69Pu02
5347.1(8)														
5350	X^-											0.059		69Pe02
5394(15)	$9^- - 15^-$													
5400.8(4)														99Ka65
5403.7(1)	$9^- - 13^-$													
5424(15)	$X^{(-)}$													
5433.5(1)	19^-													
5440(15)	$1^-, 3^-$	1	0.2	1970	0.08	240	0.358	1400						69Pu02
5461.4(5)	$9^- - 15^-$													99Ka65
5478.0(5)														99Ka65
5496	$3^+, 5^+$													67Gl09
5497(15)	$1^-, 3^-$	1	0.3	2780	0.17	420	0.112	440						69Pu02
5511.9(4)	$9^- - 15^-$													99Ka65
5506.8(6)														
5585(15)	$1^-, 3^-$	1	0.2	2060	0.12	330		incl						69Pu02
5590.0(4)	$9^- - 11^-$													99Ka65
5600	$3^+, 5^+$													67Gl09
5616.7(5)	$9^- - 11^-$													99Ka65
5628.6(1)	$11^-, 13^-$													
5685(15)	$9^- - 15^-$													
5689.4(1)														99Ka65
5720(15)	$1^-, 3^-$	1	0.1	1280	0.09	190								69Pu02
5720(15)	$9^- - 15^-$													
5786.7(6)	$9^- - 15^-$													99Ka65
5808.1(1)	11^-													
5817.7(1)	$11^-, 13^-$													
5838.2(4)														99Ka65
5849.2(6)	$9^- - 13^-$													99Ka65
5899(15)	$9^- - 15^-$													
5913.57(5)	$11^-, 13^-$													
5936(15)														

(continued)

⁵¹₂₃V

E^*	$2J^\pi$	L	C^2S'	$\sigma(\tau, d)$	C^2S'	$\sigma(\tau, d)$	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, p)$	L	L	S''	βR	Ref.
[keV]		(τ, d)	(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	$\mu b/sr$	(α, p)		(d, p)	(p, p')	
5943.2(1)	$9^- - 13^-$													
5948.5(1)	$9^- - 13^-$													
5957(15)														
5961(20)														
5981.4(1)	$9^-, 11^-$													
6005(15)	$11^+, 13^+$													
6038.7(1)	$9^-, 11^-$													
6046.1(8)	$\langle 1^- \rangle$													
6056.5(4)														99Ka65
6059.3(1)	$9^- - 13^-$													
6073(15)	$9^- - 15^-$													
6100.7(1)	$9^- - 13^-$													
6114.2(1)	$11^-, 13^-$													
6137.1(5)		1	0.1	1500			0.18	740						69Pu02
6172.1(7)														99Ka65
6181.0(8)														99Ka65
6200.3(5)														99Ka65
6219.5(8)											[1]	0.13		67De02
6228(1)*		[1]	0.1	1190										99Ka65
6247.6(2)	$\langle 21^- \rangle$													
6260.0(1)	$11^-, 13^-$													
6264.5(1)	$9^- - 13^-$													
6266.5(1)	11^-													99Ka65
6297.1(1)	$9^- - 13^-$													99Ka65
6310(15)											[1]	0.09		69Pu02
6361.7(5)											[1]	0.10		67De02
6379.8(1)	$9^- - 13^-$													
6402.8(8)														99Ka65
6437.7(1)	$11^-, 13^-$													
6455(15)	$9^- - 15^-$										[1]	0.16		67De02
6464.1(1)	$9^- - 13^-$													
6485.4(1)	$9^- - 13^-$										[1]	0.09		67De02
6495.9(1)	$11^-, 13^-$													
6529(15)											[1]	0.18		67De02
6567.4(5)														99Ka65
6570.4(1)	$11^-, 13^-$													
6579.4(1)	9^-													
6605(15)		[1]	0.08	910										
6636.0(7)														99Ka65
6675.4(1)	$11^-, 13^-$													
6830.6(1)	$11^-, 13^-$													
6931.2(1)	$11^-, 13^-$													
6977.3(1)	$9^- - 13^-$													
7272(30)	$1^-, 3^-$	1	0.2	2120										
7334.6(5)	$\langle 23^- \rangle$													

(continued)

⁵¹₂₃V

E^*	$2J^\pi$	L	C^2S'	$\sigma(\tau, d)$	C^2S'	$\sigma(\tau, d)$	C^2S	$\sigma(\tau, d)$	$\sigma(\alpha, p)$	L	L	S''	βR	Ref.
[keV]		(τ, d)	(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	(τ, d)	$\mu b/sr$	$\mu b/sr$	(α, p)		(d, p)	(p, p')	
8211.0(7)	$\langle 25^- \rangle$													
8501(30)														
9402.7(4)	3^-													
9407.5(3)	3^-													
9413.8(4)	3^-		0.6	4190										69Pu02
10545(10)	1^-													
10856	7^-													
10988	5^-													
11593.3(4)	5^-													
11608.5(4)	3^-													
11800														
12300(10)	1^-													
12359(10)	5^-													
12555(10)	3^-													
13217(10)	9^+													
					67Ob04			71Ma14					70Pr08	Ref.
			69Pu02	69Pu02		67Ob04	71Ma14		70Gi10			67De02		Ref.

Additional data on this isotope can be found in [97DeZW, 91Mi08, 86Va0A, 71Ma14, 70Pr08, 69Pe02, 68Ne03, 68Pe08].

Abundance: 99.750(2) %.

* There is a strong deviation (up to 30-50 keV) in the energy scales in different measurements at high excitations.

The first column contains $C^2S' = (2J+1)C^2S_p^+$ and $\sigma(\tau, d)$ from [69Pu02]); values C^2S' and $\sigma(\tau, d)$ from [67Ob04] and [71Ma14] are given in the columns that follow.

Spectroscopic strength S'' for the (d, p) reaction is defined as $(2J+1)(2I+1)^{-1}S(I+j=J)$ where $S(I+j=J)$ is the spectroscopic factor [67De02].

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

Energy levels and branching ratios [97Zh09]. Part 2

⁵¹₂₃V

E^*	$2J^\pi$	L	L	βR	L	S_N	$g\Gamma_\circ^{red}$	C^2S	$T_{1/2}$ or	Ref.
[keV]				(α, α')	(t, α)	(t, α)	[meV/MeV ³]	(d, τ)	Γ_{cm}	
0.0	7^-				3	4.0		3.70	Stable	69Pu02
320.083(1)	5^-	2	0	0.49					184(6) ps	67De02
928.66(7)	3^-	2	2	0.32					8.3(8) ps	69Pu02
1609.23(2)	11^-	2	2	0.55					0.55(4) ps	67De02
1813.24(2)	9^-	2	2	0.44			0.068(9)		0.58(8) ps	67De02
2410.8(1)	3^-	2	2	0.31	3	0.72			14(2) fs	69Pu02
2547.4(6)	1^+	$\langle 3 \rangle$			2	1.93		1.85	>0.7 ps	69Pu02
2677.4(1)	$\langle 3 \rangle^+$				0	0.82		3.46	0.6(1) ps	68Ne03
2699.6(1)	15^-	4							5.5(4) ps	70Pr08

(continued)

⁵¹V
₂₃

E^*	$2J^\pi$	L	L	βR	L	S_N	$g\Gamma_o^{red}$	C^2S	$T_{1/2}$ or	Ref.
[keV]				(α, α')	(t, α)	(t, α)	[meV/MeV ³]	(d, τ)	Γ_{cm}	
2790(8)										
3083.6(1)	$\langle 5 \rangle^-$						0.51(12)		10(4) fs	69Pu02
3150	$\langle 3 \rangle^-$									70Gi10
3214.8(5)	3^-								26(14) fs	69Pu02
3264.0(2)	$\langle 5 \rangle^-$	$\langle 3 \rangle$							53(12) fs	69Pe02
3280.0(3)	$\langle 5 \rangle$								139(14) fs	
3310										
3320	X^-		2	0.47						
3372(10)	$1^-, 3^-$	2								69Pu02
3377.7(1)	9^-						0.48(3)		56(7) fs	99Ka65
3381.1(10)	$\langle 3, 5 \rangle^-$								73(14) fs	
3383.2(6)	$\langle 9, 11 \rangle^-$								66(14) fs	
3385.6(1)	13^-								>0.87 ps	
3395.0(1)	$\langle 13 \rangle^-$								15(7) fs	
3412.2(8)										
3443.9(2)	$\langle 1-7 \rangle^-$	2							7 fs	67De02
3454.1(2)	9^-		2	0.44			0.39(16)		10(3) fs	99Ka65
3517.0(1)	9^-	2					0.48(3)		17(3) fs	67De02
3555(1)										
3562.2(3)	$\langle 3^- - 7^- \rangle$						0.12(1)			99Ka65
3568(1)	$\langle 1^- - 7^- \rangle$								0.08(6) ps	
3576.6(2)	$\langle 3^- - 7^- \rangle$						0.20(3)		0.06(4) ps	99Ka65
3614.0(2)	$9^-, 11^-$								187(35) fs	67De02
3623.7(5)										
3632	$3^+, 5^+$				2	1.22				67Gl09
3632.0(2)	$3^- - 7^-$	2					0.40(7)		13(3) fs	69Pe02
3663.6(10)	3^-						0.03(1)			69Pu02
3668										
3678.9(3)	3^-						0.27(2)		34(4) ps	99Ka65
3683										
3722.7(3)										
3743(8)	1^+				0	0.12				67Gl09
3748										
3765.2(11)										
3779.5(4)	$5^+, 7^+$	3					0.33(4)		26(5) fs	70Pr08
3796.5(3)	$3^- - 7^-$	2					0.21(3)		24(6) fs	67De02
3803.6(1)	$9^-, 11^-$									
3840										
3872.1(5)										67De02
3873.7(1)	15^-								<0.15 ps	
3874										
3902.3(1)	$9^+, 11^+$	3							37(19) fs	69Pe02
3919.5(1)	9^-	2					0.28(6)		14(4) fs	67De02
3939(8)	X^+	3								69Pe02
3943.3(1)	$\langle 9 \rangle^-$								90(14) fs	

(continued)

⁵¹V
23

E^*	$2J^\pi$	L	L	βR	L	S_N	$g\Gamma_o^{red}$	C^2S	$T_{1/2}$ or	Ref.
[keV]				(α, α')	(t, α)	(t, α)	[meV/MeV ³]	(d, τ)	Γ_{cm}	
4002.5(1)	$7^+, 9^-$						0.19(2)		0.17(6) fs	99Ka65
4025.3(2)	$\langle 5^-, 7 \rangle$								<17 fs	
4030										
4052.5(5)	$X\langle - \rangle$	$\langle 2 \rangle$							66(21) fs	69Pe02
4124.0(1)	$9^-, 11^-$	2							8(3) fs	67De02
4180	$\langle 1 \rangle^-$									70Gi10
4205	$3^+, 5^+$				2	0.38				67Gl09
4224.8(1)	$9^-, 11^-$									67De02
										65Ca09
4237.4(6)	$1^-, 3^-$									67Ob04
4265.2(11)	$\langle 1 \rangle^-$									69Pu02
4323.0(2)							0.39(2)			99Ka65
4450.7(2)	$\langle 3^-, 5^- \rangle$						1.10(4)			67Ob04
4446.7(1)	$9^-, 11^-$									
4463.8(2)							0.59(3)			99Ka65
4474.8(11)	$3^- - 7^-$									67De02
4493.9(1)	$11^-, 13^-$									
4505	1^+				0	0.15				67Gl09
4512(10)	X^+	3								70Pr08
4521(15)	$5^-, 7^-$									69Pu02
4539.8(11)	$\langle 3 \rangle^-$									
4558.9(5)							0.13(2)			99Ka65
4560.5(1)	$9^-, 11^-$									67De02
4582.8(1)	9^-									67De02
4633(15)	$5^-, 7^-$									69Pu02
4651.2(6)										
4660.8(5)										
4670	$X\langle - \rangle$	$\langle 2 \rangle$								69Pe02
4680										
4689(1)		2								69Pe02
4755(15)	$\langle 5^-, 7^- \rangle$									67Ob04
4768.5(3)	5^-						2.11(75)			67De02
4775.4(3)	$9^-, 11^-$						0.65(3)			67De02
4790	X^-									
4800										67De02
4820.8(1)	17^-								0.14(4) ps	
4838.3(15)	$9^-, 11^-$						0.05(2)			99Ka65
4843.4(3)	3^-						0.65(4)			67De02
										65Ca09
4849(15)	$1^-, 3^-$									69Pu02
4864.7(6)	3^-									67De02
4885.3(3)							0.53(4)			99Ka65
4894.2(1)	$11^- - 15^-$									
4907	1^+				0	0.15				67Gl09
4916.1(1)	$\langle 9-13 \rangle^-$									

(continued)

⁵¹V
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E^*	$2J^\pi$	L	L	βR	L	S_N	$g\Gamma_{\circ}^{red}$	C^2S	$T_{1/2}$ or	Ref.
[keV]				(α, α')	(t, α)	(t, α)	[meV/MeV ³]	(d, τ)	Γ_{cm}	
4936.1(6)	$X^{(-)}$						0.09(2)			99Ka65
4943.9(6)										
4949.5(5)							0.13(2)			99Ka65
4977.7(5)	$1^-, 3^-$						0.12(1)			69Pu02
5019.9(1)	$9^- - 13^-$									
5030.2(1)	$9^- - 13^-$									
5037(10)	X^-									67De02
5069.8(3)	$3^+, 5^+$				2	0.34	0.38(2)			99Ka65
5080.2(4)	X^-						0.19(2)			99Ka65
5104(15)	1^+									67Ob04
5113.3(1)	$11^-, 13^-$									
5127(15)	$3^+, 5^+$									69Pu02
5137.5(3)							0.75(4)			99Ka65
5142(15)	$9^- - 15^-$									
5160(15)	$9^- - 15^-$									
5181.8(6)	$3^+, 5^+$									67Ob04
5188.4(1)	$11^- - 15^-$									
5208.5(1)	$9^-, 11^-$						0.13(2)			99Ka65
5249.0(5)							0.12(2)			99Ka65
5256.0(1)	$11^- - 15^-$									
5292.3(5)							0.10(2)			99Ka65
5308.1(1)	9^-									
5311.2(5)	$\langle 3^-, 5^- \rangle$	(2)								69Pe02
5325.4(1)	$9^-, 11^-$						0.15(2)			99Ka65
5333.3(1)	$9^- - 13^-$									
5341.3(7)	$1^-, 3^-$									69Pu02
5347.1(8)										
5350	X^-	2								69Pe02
5394(15)	$9^- - 15^-$									
5400.8(4)							0.34(3)			99Ka65
5403.7(1)	$9^- - 13^-$									
5424(15)	$X^{(-)}$									
5433.5(1)	19^-								0.16(5) ps	
5440(15)	$1^-, 3^-$									69Pu02
5461.4(5)	$9^- - 15^-$						0.31(1)			99Ka65
5478.0(5)							0.21(9)			99Ka65
5496	$3^+, 5^+$				2	0.36				67Gl09
5497(15)	$1^-, 3^-$									69Pu02
5511.9(4)	$9^- - 15^-$						0.34(3)			99Ka65
5506.8(6)										
5585(15)	$1^-, 3^-$									69Pu02
5590.0(4)	$9^- - 11^-$						0.55(4)			99Ka65
5600	$3^+, 5^+$				2	0.60				67Gl09
5616.7(5)	$9^- - 11^-$						0.17(3)			99Ka65
5628.6(1)	$11^-, 13^-$									

(continued)

**⁵¹V
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E^*	$2J^\pi$	L	L	βR	L	S_N	$g\Gamma_{\circ}^{red}$	C^2S	$T_{1/2}$ or	Ref.
[keV]				(α, α')	(t, α)	(t, α)	[meV/MeV ³]	(d, τ)	Γ_{cm}	
5685(15)	$9^- - 15^-$									
5689.4(1)							0.21(3)			99Ka65
5720(15)	$1^-, 3^-$									69Pu02
5720(15)	$9^- - 15^-$									
5786.7(6)	$9^- - 15^-$						0.22(3)			99Ka65
5808.1(1)	11^-									
5817.7(1)	$11^-, 13^-$									
5838.2(4)							0.73(7)			99Ka65
5849.2(6)	$9^- - 13^-$						0.21(3)			99Ka65
5899(15)	$9^- - 15^-$									
5913.57(5)	$11^-, 13^-$									
5936(15)										
5943.2(1)	$9^- - 13^-$									
5948.5(1)	$9^- - 13^-$									
5957(15)										
5961(20)										
5981.4(1)	$9^-, 11^-$									
6005(15)	$11^+, 13^+$									
6038.7(1)	$9^-, 11^-$									
6046.1(8)	$\langle 1^- \rangle$									
6056.5(4)							0.69(6)			99Ka65
6059.3(1)	$9^- - 13^-$									
6073(15)	$9^- - 15^-$									
6100.7(1)	$9^- - 13^-$									
6114.2(1)	$11^-, 13^-$									
6137.1(5)							0.59(6)			69Pu02
6172.1(7)							0.22(4)			99Ka65
6181.0(8)							0.18(4)			99Ka65
6200.3(5)							0.88(9)			99Ka65
6219.5(8)										67De02
6228(1)*							1.00(11)			99Ka65
6247.6(2)	$\langle 21^- \rangle$								0.15(10) ps	
6260.0(1)	$11^-, 13^-$									
6264.5(1)	$9^- - 13^-$									
6266.5(1)	11^-						0.72(13)			99Ka65
6297.1(1)	$9^- - 13^-$						0.95(9)			99Ka65
6310(15)										69Pu02
6361.7(5)							0.82(8)			67De02
6379.8(1)	$9^- - 13^-$									
6402.8(8)							0.36(5)			99Ka65
6437.7(1)	$11^-, 13^-$									
6455(15)	$9^- - 15^-$									67De02
6464.1(1)	$9^- - 13^-$									
6485.4(1)	$9^- - 13^-$									67De02
6495.9(1)	$11^-, 13^-$									

(continued)

⁵¹V
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E^*	$2J^\pi$	L	L	βR	L	S_N	$g\Gamma_{\circ}^{red}$	C^2S	$T_{1/2}$ or	Ref.
[keV]				(α, α')	(t, α)	(t, α)	[meV/MeV ³]	(d, τ)	Γ_{cm}	
6529(15)										67De02
6567.4(5)							2.00(18)			99Ka65
6570.4(1)	11 ⁻ , 13 ⁻									
6579.4(1)	9 ⁻									
6605(15)										
6636.0(7)							0.39(7)			99Ka65
6675.4(1)	11 ⁻ , 13 ⁻									
6830.6(1)	11 ⁻ , 13 ⁻									
6931.2(1)	11 ⁻ , 13 ⁻									
6977.3(1)	9 ⁻ –13 ⁻									
7272(30)	1 ⁻ , 3 ⁻									
7334.6(5)	$\langle 23^- \rangle$								0.28(11) ps	
8211.0(7)	$\langle 25^- \rangle$									
8501(30)										
9402.7(4)	3 ⁻								7(2) eV	
9407.5(3)	3 ⁻								47(6) eV	
9413.8(4)	3 ⁻								9(2) eV	69Pu02
10545(10)	1 ⁻								4.0 keV	
10856	7 ⁻									
10988	5 ⁻									
11593.3(4)	5 ⁻								3.9(10) keV	
11608.5(4)	3 ⁻								4.1(10) keV	
11800										
12300(10)	1 ⁻									
12359(10)	5 ⁻									
12555(10)	3 ⁻									
13217(10)	9 ⁺									
				68Pe08		67Gl09	99Ka65	68Ne03		Ref.
					67Gl09	97Zh09				Ref.

Energy levels and branching ratios [97Zh09]. Part 3

⁵¹V
₂₃

E^*	$2J^\pi$	Branching ratios in percentage										
		E_f^* :	0.0	320	929	1609	1813	2411	2547	2677	2700	3084
[keV]		$2J_f^\pi$:	7 ⁻	5 ⁻	3 ⁻	11 ⁻	9 ⁻	3 ⁻	1 ⁺	$\langle 3 \rangle^+$	15 ⁻	$\langle 5 \rangle^-$
320.083(1)	5 ⁻		100									
928.66(7)	3 ⁻		86(1)	14(1)								
1609.23(2)	11 ⁻		100									
1813.24(2)	9 ⁻		75(2)	24(2)		1.0(5)						
2410.8(1)	3 ⁻		19(2)	72(2)	8.6(8)							
2547.4(6)	1 ⁺				100							
2677.4(1)	$\langle 3 \rangle^+$				100							

(continued)

⁵¹V
23

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	0.0 7 ⁻	320 5 ⁻	929 3 ⁻	1609 11 ⁻	1813 9 ⁻	2411 3 ⁻	2547 1 ⁺	2677 (3) ⁺	2700 15 ⁻	3084 (5) ⁻
2699.6(1)	15 ⁻					100						
3083.6(1)	(5) ⁻		23(4)	40(3)	31(2)			6(1)				
3214.8(5)	3 ⁻			16(3)	55(3)			30(3)				
3264.0(2)	(5) ⁻			89	10			1.0				
3280.0(3)	(5)			52(4)	34(4)			14				
3377.7(1)	9 ⁻		88(4)	12(1)								
3381.1(10)	(3,5) ⁻		100									
3383.2(6)	(9,11) ⁻		61(10)			26(3)	13(2)					
3385.6(1)	13 ⁻					96(19)	1.1(2)				3.0(6)	
3395.0(1)	(13) ⁻					44(7)	56(6)					
3412.2(8)				100								
3443.9(2)	(1-7) ⁻				100							
3454.1(2)	9 ⁻		38	62								
3517.0(1)	9 ⁻		70(4)	22(1)			7.2(14)					
3555(1)			100									
3562.2(3)	(3 ⁻ -7 ⁻)		100									
3568(1)	(1 ⁻ -7 ⁻)			100								
3576.6(2)	(3 ⁻ -7 ⁻)		60(4)	40(4)								
3614.0(2)	9 ⁻ ,11 ⁻		2.5(1)			76(15)	22(5)					
3623.7(5)			16(5)	61(5)	23							
3632.0(2)	3 ⁻ -7 ⁻		24(5)	76(5)								
3663.6(10)	3 ⁻		100									
3668				67	7			26				
3678.9(3)	3 ⁻		100									
3683			75									25
3722.7(3)			100									
3748				100								
3765.2(11)				100								
3779.5(4)	5 ⁺ ,7 ⁺		≈50	50								
3796.5(3)	3 ⁻ -7 ⁻		60		40							
3803.6(1)	9 ⁻ ,11 ⁻		19(1)			41(4)	40(8)					
3872.1(5)			15	15	70							
3873.7(1)	15 ⁻					0.9(1)					90(17)	
3874			55	40	5							
3902.3(1)	9 ⁺ ,11 ⁺					68(7)	32(3)					
3919.5(1)	9 ⁻		[56]				[44]					
3943.3(1)	(9) ⁻			1.8(1)		61(6)	37(4)					
4002.5(1)	7 ⁺ ,9 ⁻		84(4)	16(1)								
4025.3(2)	(5 ⁻ ,7)						100					
4052.5(5)	X ⁽⁻⁾			100								
4124.0(1)	9 ⁻ ,11 ⁻		11(1)			89(9)						
4224.8(1)	9 ⁻ ,11 ⁻		1.7			46(4)	48(5)					
4237.4(6)	1 ⁻ ,3 ⁻			40				60				
4446.7(1)	9 ⁻ ,11 ⁻		0.44(2)			23(2)	1.2(1)					
4493.9(1)	11 ⁻ ,13 ⁻					31(3)					28(6)	

(continued)

⁵¹V₂₃

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	0.0 7 ⁻	320 5 ⁻	929 3 ⁻	1609 11 ⁻	1813 9 ⁻	2411 3 ⁻	2547 1 ⁺	2677 $\langle 3 \rangle^+$	2700 15 ⁻	3084 $\langle 5 \rangle^-$
4560.5(1)	9 ⁻ ,11 ⁻		21.1(10)			43(4)						
4582.8(1)	9 ⁻			15.7(8)			6.5(7)					
4651.2(6)				65	35							
4660.8(5)				46	38							8
4768.5(3)	5 ⁻	78			16							5
4864.7(6)	3 ⁻				75			8				
4894.2(1)	11 ⁻ -15 ⁻					59(3)						
4916.1(1)	$\langle 9-13 \rangle^-$					6.4(3)						
4943.9(6)												42
5019.9(1)	9 ⁻ -13 ⁻						79(4)					
5030.2(1)	9 ⁻ -13 ⁻					29(2)	18.7(9)					
5113.3(1)	11 ⁻ ,13 ⁻					31(2)	17.3(8)				52(5)	
5137.5(3)		94										
5181.8(6)	3 ⁺ ,5 ⁺			62				38				
5188.4(1)	11 ⁻ -15 ⁻										24(3)	
5208.5(1)	9 ⁻ ,11 ⁻	9.8(5)				57(3)	19(1)					
5256.0(1)	11 ⁻ -15 ⁻										48(5)	
5308.1(1)	9 ⁻			14.2(7)		29(1)	27(1)					
5311.2(5)	$\langle 3^-,5^- \rangle$	20		40	40							
5325.4(1)	9 ⁻ ,11 ⁻	11.4(6)				57(3)						
5333.3(1)	9 ⁻ -13 ⁻					4.9(2)	35(2)					
5341.3(7)	1 ⁻ ,3 ⁻			60								
5347.1(8)					100							
5403.7(1)	9 ⁻ -13						26(1)					
5506.8(6)				70								30
5628.6(1)	11 ⁻ ,13 ⁻					5.2(3)	17.9(9)				22(2)	
5808.1(1)	11 ⁻	1.6(2)									3.8(2)	
5817.7(1)	11 ⁻ ,13 ⁻										36(2)	
5849.2(6)	9 ⁻ -13 ⁻						25(1)					
5913.57(5)	11 ⁻ ,13 ⁻						1.8(1)				11.8(6)	
5943.2(1)	9 ⁻ -13 ⁻						11.8(7)					
5948.5(1)	9 ⁻ -13					39(2)						
5981.4(1)	9 ⁻ ,11 ⁻	34(2)					45(2)					
6038.7(1)	9 ⁻ ,11 ⁻	3.5(2)				34(2)	7.7(3)					
6046.1(8)	$\langle 1^- \rangle$				100							
6114.2(1)	11 ⁻ ,13 ⁻						19.5(10)				7.8(3)	
6260.0(1)	11 ⁻ ,13 ⁻						1.5(1)				16.1(9)	
6264.5(1)	9 ⁻ -13 ⁻					43(2)						
6266.5(1)	11 ⁻	16(1)				64(3)					7.5(4)	
6297.1(1)	9 ⁻ -13 ⁻			2.0(2)			62(3)					
6437.7(1)	11 ⁻ ,13 ⁻					26(1)						
6485.4(1)	9 ⁻ -13 ⁻			4.6(2)		47(2)						
6495.9(1)	11 ⁻ ,13 ⁻					15(1)	5.1(3)				36(2)	
6570.4(1)	11 ⁻ ,13 ⁻					32(2)	8					
6579.4(1)	9 ⁻			15(1)								

(continued)

⁵¹V
₂₃

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	0.0 7 ⁻	320 5 ⁻	929 3 ⁻	1609 11 ⁻	1813 9 ⁻	2411 3 ⁻	2547 1 ⁺	2677 $\langle 3 \rangle^+$	2700 15 ⁻	3084 $\langle 5 \rangle^-$
6675.4(1)	11 ⁻ ,13 ⁻					22(1)						
6830.6(1)	11 ⁻ ,13 ⁻						3.7(1)					
6931.2(1)	11 ⁻ ,13 ⁻					18(1)					34(2)	
6977.3(1)	9 ⁻ -13 ⁻						4.4(3)					
9402.7(4)	3 ⁻		6.00	35	8.00			4.00		3.00		
9407.5(3)	3 ⁻		1.20	28	12.15			1.61	3.61			3.21
9413.8(4)	3 ⁻		1.20	18.80				4.40		17.80		3.40
11593.3(4)	5 ⁻		31	31	6.3			12.8				3.5
11608.5(4)	3 ⁻			12.7	9.6			15.0	4.8	22		

Energy levels and branching ratios [97Zh09]. Part 4

⁵¹V
₂₃

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		$E_f^*:$ $2J_f^\pi:$	3215 3 ⁻	3264 $\langle 5 \rangle^-$	3378 9 ⁻	3385.6 13 ⁻	3395.0 $\langle 13 \rangle^-$	3412.2	3517.0 9 ⁻	3554.8	3576.6	3614.0 9 ⁻ ,11 ⁻
3873.7(1)	15 ⁻					9.3(19)						
3919.5(1)	9 ⁻			≤ 2.4								
4124.0(1)	9 ⁻ ,11 ⁻			0.7(2)								
4224.8(1)	9 ⁻ ,11 ⁻								1.8(3)			2.5(5)
4446.7(1)	9 ⁻ ,11 ⁻					15(3)	1.7(3)					55(11)
4493.9(1)	11 ⁻ ,13 ⁻											7(2)
4560.5(1)	9 ⁻ ,11 ⁻						18(3)		10(2)			
4582.8(1)	9 ⁻						50(10)					
4660.8(5)		8										
4820.8(1)	17 ⁻					8.0(10)						
4864.7(6)	3 ⁻	17										
4894.2(1)	11 ⁻ -15 ⁻											24(5)
4916.1(1)	$\langle 9-13 \rangle^-$						9(2)					56(11)
4943.9(6)		12									46	
5030.2(1)	9 ⁻ -13 ⁻					52(10)						
5137.5(3)											6	
5188.4(1)	11 ⁻ -15 ⁻					47(9)						
5256.0(1)	11 ⁻ -15 ⁻					25(5)						7(1)
5333.3(1)	9 ⁻ -13 ⁻				11(2)		27(6)					11(2)
5341.3(7)	1 ⁻ ,3 ⁻							40				
5403.7(1)	9 ⁻ -13 ⁻					10(1)	7(1)		17(3)			
5628.6(1)	11 ⁻ ,13 ⁻					36(3)	9(1)					
5808.1(1)	11 ⁻					16(2)						
5817.7(1)	11 ⁻ ,13 ⁻								22(2)			
5849.2(6)	9 ⁻ -13 ⁻					11(1)						24(2)
5913.57(5)	11 ⁻ ,13 ⁻					28(3)						
5943.2(1)	9 ⁻ -13 ⁻								36(4)			

(continued)

⁵¹V
₂₃

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	3215 3^-	3264 $\langle 5 \rangle^-$	3378 9^-	3385.6 13^-	3395.0 $\langle 13 \rangle^-$	3412.2	3517.0 9^-	3554.8	3576.6	3614.0 $9^-, 11^-$
5948.5(1)	$9^- - 13^-$				5.6(5)				18(2)			
5981.4(1)	$9^-, 11^-$				6.1(5)							
6038.7(1)	$9^-, 11^-$				15(1)	12(1)	28(3)					
6059.3(1)	$9^- - 13^-$					17(2)	5.1(6)					46(5)
6100.7(1)	$9^- - 13^-$				6.7(6)	18(2)	5.5(6)		17(1)			29(3)
6114.2(1)	$11^-, 13^-$						1.7(2)					
6219.5(8)										100		
6264.5(1)	$9^- - 13^-$								17(2)			
6266.5(1)	11^-					6.7(7)						
6379.8(1)	$9^- - 13^-$					15(2)	15(2)					
6437.7(1)	$11^-, 13^-$					42(2)						2.6(3)
6464.1(1)	$9^- - 13^-$								47.5(5)			
6485.4(1)	$9^- - 13^-$				5.2(2)							18(2)
6570.4(1)	$11^-, 13^-$					27(1)						
6579.4(1)	9^-				4	14(1)						
6675.4(1)	$11^-, 13^-$					8						15(1)
6830.6(1)	$11^-, 13^-$				12.1(5)	3.8(1)	4.6(3)					
6931.2(1)	$11^-, 13^-$					3.6(1)			11(1)			3.4(1)
6977.3(1)	$9^- - 13^-$								20(1)			
9402.7(4)	3^-		8.00								8.00	
9407.5(3)	3^-							1.00			0.50	
9413.8(4)	3^-			11.10								
11593.3(4)	5^-		1.9	1.1								
11608.5(4)	3^-			15.1						3.9		6.6

Energy levels and branching ratios [97Zh09]. Part 5

⁵¹V
₂₃

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	3623.7	3677.8 $\langle 3^- \rangle$	3765.2	3803.6 $9^-, 11^-$	3872.1	3873.7 15^-	3874	3902.3 $9^+, 11^+$	3920 9^-	3943.3 $\langle 9 \rangle^-$
4446.7(1)	$9^-, 11^-$									2.7(6)		
4493.9(1)	$11^-, 13^-$							22(4)		12(2)		
4560.5(1)	$9^-, 11^-$											1.6(3)
4582.8(1)	9^-					7(1)						
4820.8(1)	17^-							92.0(10)				
4894.2(1)	$11^- - 15^-$							17(4)				
4916.1(1)	$\langle 9 - 13 \rangle^-$										7(2)	22(4)
5019.9(1)	$9^- - 13^-$										21(5)	
5188.4(1)	$11^- - 15^-$											29(6)
5208.5(1)	$9^-, 11^-$										2.6(5)	10(2)
5256.0(1)	$11^- - 15^-$								5.5(11)			
5308.1(1)	9^-										10(2)	

(continued)

⁵¹V
23

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	3623.7	3677.8	3765.2	3803.6	3872.1	3873.7	3874	3902.3	3920	3943.3
				$\langle 3^- \rangle$		$9^-, 11^-$		15^-		$9^+, 11^+$	9^-	$\langle 9^- \rangle$
5325.4(1)	$9^-, 11^-$											15(3)
5403.7(1)	$9^- - 13$									6(1)		
5433.5(1)	19^-							36.0(10)				
5817.7(1)	$11^-, 13^-$											14(1)
5913.57(5)	$11^-, 13^-$									4.7(5)		14(3)
6059.3(1)	$9^- - 13^-$					7.2(7)						
6100.7(1)	$9^- - 13^-$									23(2)		
6114.2(1)	$11^-, 13^-$					68(6)				3.3(3)		
6260.0(1)	$11^-, 13^-$									6.6(7)		
6264.5(1)	$9^- - 13^-$					7(1)				6	7(1)	
6266.5(1)	11^-									6.2(6)		
6297.1(1)	$9^- - 13^-$										5.7(6)	6(1)
6379.8(1)	$9^- - 13^-$											14(1)
6437.7(1)	$11^-, 13^-$											21(2)
6464.1(1)	$9^- - 13^-$									8.7(9)		
6495.9(1)	$11^-, 13^-$					20(2)						
6570.4(1)	$11^-, 13^-$								6(1)			
6579.4(1)	9^-					12(1)		3		17(2)		7(1)
6675.4(1)	$11^-, 13^-$								16(2)		8(1)	11(1)
6830.6(1)	$11^-, 13^-$							36(4)				
6931.2(1)	$11^-, 13^-$					19(1)				10.7(5)		
6977.3(1)	$9^- - 13^-$									14(1)		
9402.7(4)	3^-						9.00					
9407.5(3)	3^-		1.00		1.91							
11593.3(4)	5^-			2.9								

Energy levels and branching ratios [97Zh09]. Part 6

⁵¹V
23

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	4002.5	4124.0	4224.8	4237.4	4265.2	4446.7	4474.8	4493.9	4539.8	4560.5
			$7^+, 9^-$	$9^-, 11^-$	$9^-, 11^-$	$1^-, 3^-$	$\langle 1^- \rangle$	$9^-, 11^-$		$11^-, 13^-$	$\langle 3^- \rangle$	$9^-, 11^-$
4560.5(1)	$9^-, 11^-$		6(1)									
4582.8(1)	9^-		21(4)									
5208.5(1)	$9^-, 11^-$			1.4(3)								
5256.0(1)	$11^- - 15^-$							4.2(8)		7(1)		3.0(6)
5308.1(1)	9^-		19(4)									
5325.4(1)	$9^-, 11^-$				16(3)							
5333.3(1)	$9^- - 13^-$		8(2)		3.2(7)							
5403.7(1)	$9^- - 13$									35(1)		
5808.1(1)	11^-			22(4)						18(4)		
5817.7(1)	$11^-, 13^-$											20(4)
5849.2(6)	$9^- - 13^-$		13(3)									9(2)

(continued)

⁵¹₂₃V

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	4002.5 7 ⁺ ,9 ⁻	4124.0 9 ⁻ ,11 ⁻	4224.8 9 ⁻ ,11 ⁻	4237.4 1 ⁻ ,3 ⁻	4265.2 ⟨1⟩ ⁻	4446.7 9 ⁻ ,11 ⁻	4474.8	4493.9 11 ⁻ ,13 ⁻	4539.8 ⟨3⟩ ⁻	4560.5 9 ⁻ ,11 ⁻
5913.57(5)	11 ⁻ ,13 ⁻											15(3)
5943.2(1)	9 ⁻ -13 ⁻			26(5)						11(2)		
6059.3(1)	9 ⁻ -13 ⁻											22(4)
6264.5(1)	9 ⁻ -13 ⁻											16(3)
6379.8(1)	9 ⁻ -13 ⁻		6(1)	8(1)	13(1)							24(5)
6437.7(1)	11 ⁻ ,13 ⁻				3.3(4)							
6464.1(1)	9 ⁻ -13 ⁻		3.6(4)							10(2)		
6485.4(1)	9 ⁻ -13 ⁻			9(1)								
6570.4(1)	11 ⁻ ,13 ⁻				9(1)							12(1)
6579.4(1)	9 ⁻											18(2)
6675.4(1)	11 ⁻ ,13 ⁻							9(1)				
6830.6(1)	11 ⁻ ,13 ⁻									11(1)		
6977.3(1)	9 ⁻ -13 ⁻											5
9407.5(3)	3 ⁻					1.00	4.12					
11593.3(4)	5 ⁻								1.50		2.40	

Energy levels and branching ratios [97Zh09]. Part 7

⁵¹₂₃V

E^* [keV]	$2J^\pi$	Branching ratios in percentage										
		E_f^* : $2J_f^\pi$:	4582.8 9 ⁻	4651.2	4660.8	4689.0	4770.0 5 ⁻	4820.8 17 ⁻	4844.8 ⟨3⟩ ⁻	4864.7 3 ⁻	4916.13	4943.9
5433.5(1)	19 ⁻							64.0(10)				
5628.6(1)	11 ⁻ ,13 ⁻		2.1(4)									
5808.1(1)	11 ⁻		9(2)									
5913.57(5)	11 ⁻ ,13 ⁻		14(3)									
6247.6(2)	⟨21 ⁻ ⟩							<3				
6464.1(1)	9 ⁻ -13 ⁻		21(4)									
6675.4(1)	11 ⁻ ,13 ⁻										10(2)	
6830.6(1)	11 ⁻ ,13 ⁻		3.4(4)								26(5)	
9402.7(4)	3 ⁻						11.00					
9407.5(3)	3 ⁻			6.33	7.43		2.71			5.82		1.91
9413.8(4)	3 ⁻			24			7.80					
11593.3(4)	5 ⁻								5.00			
11608.5(4)	3 ⁻				6.6	3.9						

Energy levels and branching ratios [97Zh09]. Part 8

⁵¹V₂₃

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* : $2J_f^\pi$:	5019.9	5030.2	5113.3 $11^-,13^-$	5138.5	5181.8 $3^+,5^+$	5188.4 11^--15^-	5208.5 $9^-,11^-$	5256.0 11^--15^-	5308.2 9^-	5311.2 $\langle 3^-,5^- \rangle$
5333.3(1)	9^--13^-	x										
5628.6(1)	$11^-,13^-$	4.0(8)	3.2(7)									
5808.1(1)	11^-				19(4)				11(2)			
5817.7(1)	$11^-,13^-$				8(2)							
5849.2(6)	9^--13^-	8(2)									5(1)	
5913.57(5)	$11^-,13^-$	11(2)										
5943.2(1)	9^--13^-				15(3)							
5948.5(1)	9^--13^-	20(4)								11(2)	7(2)	
5981.4(1)	$9^-,11^-$				14(3)							
6059.3(1)	9^--13^-	3.5(7)										
6260.0(1)	$11^-,13^-$								5.7(12)			
6297.1(1)	9^--13^-							9(2)				
6437.7(1)	$11^-,13^-$							4.4(9)				
6464.1(1)	9^--13^-							7.2(14)				
6485.4(1)	9^--13^-									16(3)		
6977.3(1)	9^--13^-				14(3)				43(8)			
9402.7(4)	3^-					8.00						
9407.5(3)	3^-					5.82	1.00					1.91
9413.8(4)	3^-					11.10						

Energy levels and branching ratios [97Zh09]. Part 9

⁵¹V₂₃

E^*	$2J^\pi$	Branching ratios in percentage										
[keV]		E_f^* :	5325.4	5333.3	5341.3	5347.1	5403.7	5433.5	5506.8	5849.8	5913.6	5948.5
		$2J_f^\pi$:	9 ⁻ ,11 ⁻		1 ⁻ ,3 ⁻			19 ⁻			11 ⁻ ,13 ⁻	
5849.2(6)	9 ⁻ -13 ⁻		5(1)									
6247.6(2)	⟨21 ⁻ ⟩							100				
6260.0(1)	11 ⁻ ,13 ⁻		67(13)	3.3(7)								
6264.5(1)	9 ⁻ -13 ⁻			4(1)								
6297.1(1)	9 ⁻ -13 ⁻					16(3)						
6379.8(1)	9 ⁻ -13 ⁻			6(1)								
6464.1(1)	9 ⁻ -13 ⁻									1.6(3)		
6495.9(1)	11 ⁻ ,13 ⁻										17(4)	6(1)
7334.6(5)	⟨23 ⁻ ⟩							<10				
9407.5(3)	3 ⁻				1.00	1.91			3.01			

Energy levels and branching ratios [97Zh09]. Part 10

⁵¹V₂₃

E^*	$2J^\pi$	E_f^* :	5981.4	Branching ratios in percentage				7334.6
[keV]		$2J_f^\pi$:	$9^-, 11^-$	6038.6	6046.1	6219.5	6247.6	$\langle 23^- \rangle$
				$9^-, 11^-$	$\langle 1^- \rangle$		$\langle 21^- \rangle$	
6570.4(1)	$11^-, 13^-$			7(2)				
6579.4(1)	9^-		10(2)					
7334.6(5)	$\langle 23^- \rangle$						100	
8211.0(7)	$\langle 25^- \rangle$							x
9407.5(3)	3^-				1.10	1.10		

Energy levels and branching ratios [00Hu06].

⁵²V₂₃

E^*	J^π	L	$d\sigma/d\Omega$	σ (τ, p)	L	$(2J+1)S$	L	$C^2 S'$	$T_{1/2}$ or	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(d, p)	<i>rel.</i>	(t, d)	(t, d)	Γ_{cm}	
0.0	3^+	2	54		1	100			3.74 m	75Ca07
17.156(6)	$2^+, 3^+$	[2]	109		1	325	1	1.6	1.1(2) ns	87Ka40
22.764(3)	$\langle 5 \rangle^+$	[4]	incl			incl		incl		87Ka40
141.611(6)	1^+	[0]	279	160(30)	1	90	1	0.42		87Ka40
147.845(3)	4^+	[2]	incl			incl				75Ca07
436.635(9)	2^+		9		1	13	1	0.10		87Ka40
793.55(1)	3^+				1	60				65Ca09
845.94(1)	4^+	$\langle 3 \rangle$	17		1	99	1	0.04		87Ka40
881(14)										
1289.85(2)	$\langle 1 \rangle^+$	0+2	157	105(20)			1+3	0.03+0.02		87Ka40
1418.81(1)	3^+				1	21	1	0.11		87Ka40
1493.1(2)	7^+				1+3	0.5+14.3			2(1) ps	65Ca09
1558.85(2)	4^+				1	≈ 100	1	0.27		87Ka40
1579.16(4)					1	≈ 10				65Ca09
1664(6)	1^+	0+2	580	305(50)			3	0.11		87Ka40
1732.57(2)	$3^-, 4^-$				[0]	1.5				65Ca09
1759.62(2)	3^+	2	115		1+3	2.5+17.5				75Ca07
1770.17(2)							1+3	0.6		87Ka40
1795.12(2)	2^+		19		1	14				65Ca09
1843(12)	X^+				3	14.5	1	0.06		87Ka40
2100.83(1)	3^+		21	43(10)	1	34	1+3	0.3+0.2		87Ka40
2152(10)	1^+	0+2	129	110(20)	3	77	3	0.91		87Ka40
2168.64(2)	4^+				1	22				65Ca09
2318.03(3)	3^+		11		1	21	1+3	0.12+0.10		87Ka40
2347										
2396(10)**	0^+	0	233	145(30)						75Ca07
2427.66(2)	$2^+, 3^+$	2	42		1	19	1+3	0.2		87Ka40
2473(13)										
2538.82(2)	$\langle 3-5 \rangle^+$				1	19	1	0.05		87Ka40
2543.0(3)	$\langle 9^+ \rangle$								6(1) ps	
2559.38(5)										

(continued)

⁵²V
₂₃

E^*	J^π	L	$d\sigma/d\Omega$	σ (τ, p)	L	$(2J+1)S$	L	$C^2 S'$	$T_{1/2}$ or	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(d, p)	rel.	(t, d)	(t, d)	Γ_{cm}	
2591(10)	1 ⁺	0+2	913	487(50)						75Ca07
2697(10)	0 ⁺	0	68							75Ca07
2743.05(5)										
2775.88(4)	X ⁺		28		1	7				75Ca07
2824.58(3)										
2858.88(3)	$\langle 2-4 \rangle^+$				1	15	3	0.11		87Ka40
2881(10)	1 ⁺ -3 ⁺	2	82							75Ca07
2910.38(5)	X ⁺				1	1.7				65Ca09
2987.29(3)										
3009.15(6)	X ⁺				1	9				65Ca09
3059.54(4)	$\langle 2, 3 \rangle^+$	$\langle 2 \rangle$	22		1	31	1	0.11		87Ka40
3149		$\langle 2 \rangle$	68							75Ca07
3184.31(4)							1+3	0.2		87Ka40
3194.27(2)	4 ⁺				1	33				65Ca09
3198.91(6)										
3243(10)	X ⁺		17		1+3	1.5+22				75Ca07
3315.20(6)	X ⁺				1	17	1	0.12		87Ka40
3333.19(5)			21							75Ca07
3450.04(5)	X ⁻				2	2.6				65Ca09
3473.79(6)	X ⁺				1	5	1+3	0.2		65Ca09
3509(13)	X ⁻				2	6.5				65Ca09
3538.51(5)	$\langle 1, 2 \rangle^-$		79				4	0.42		75Ca07
3575.97(4)	3 ⁺	2+4	21	101(20)	1	4.7				75Ca07
3644.97(6)	X ⁺				1	3				65Ca09
3687(8)	X ⁻		53				4	0.29		75Ca07
3729.61(5)	3 ⁺		33							75Ca07
3733.15(3)	X ⁺				1					65Ca09
3777.09(3)	X ⁻		23				4	0.90		87Ka40
3808.51(3)	1 ⁺ -3 ⁺	2	65							75Ca07
3875(12)	X ⁺		13				3	0.30		87Ka40
3940(10)	X ⁻						4	0.20		87Ka40
3960(10)	X ⁺				1					65Ca09
4034(10)	X ⁻						4	0.32		87Ka40
4108.70(5)			46							75Ca07
4120(10)	X ⁻						4	0.34		87Ka40
4278.70(4)	X ⁻		80							75Ca07
4285.26(6)										
4327(15)	$\langle 8 \rangle^-$		62				4	1.18		87Ka40
4419.58(6)			41				1+3	0.22+0.18		87Ka40
4455(15)	X ⁻		10		2					75Ca07
4483.0(1)			61							75Ca07
4518.9(1)										
4533(10)	X ⁻						4	0.33		87Ka40
4557(15)	1 ⁺ -3 ⁺	2	156							75Ca07
4609.4(1)	1 ⁺	0+2	147	96(30)			3	0.11		74Ha55

(continued)

⁵²V
₂₃

E^*	J^π	L	$d\sigma/d\Omega$	σ (τ, p)	L	$(2J+1)S$	L	C^2S'	$T_{1/2}$ or	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(d,p)	rel.	(t,d)	(t,d)	Γ_{cm}	
4717(8)	X ⁺		93				3	0.33		87Ka40
4755.0(1)										
4772(10)	X ⁺						1	0.10		87Ka40
4904(8)	X ⁺		29				3	0.24		87Ka40
4951(15)			62							75Ca07
4986(9)	$\langle 1-3 \rangle^+$	$\langle 2 \rangle$	27				1+3	0.3+0.1		87Ka40
5038.9(1)										
5080(8)	X ⁻		8				4	0.20		87Ka40
5096(15)			108							75Ca07
5187(10)	X ⁻						4	0.38		87Ka40
5233(15)			22							75Ca07
5276(8)	X ⁺		30				1	0.40		87Ka40
5344(11)	X ⁺		32				1	0.22		87Ka40
5410(15)	1^+-3^+	$\langle 2 \rangle$	57							75Ca07
5488(12)	X ⁺		39				1	0.29		87Ka40
5548(8)	X ⁻		56				4	0.26		87Ka40
5600(15)			78							75Ca07
5646(8)	X ⁺		106				1	0.18		87Ka40
5711(15)			65							75Ca07
5744(8)	1^+-3^+	$\langle 2 \rangle$	142				3	0.22		87Ka40
5813(15)			76							75Ca07
5851(8)	X ⁺		39				3	0.33		87Ka40
5946(8)	X ⁺		162				3	0.18		87Ka40
6021(15)			89							75Ca07
6086(8)	X ⁺		185				3	0.17		87Ka40
6167(8)	X ⁺		98				1+3	0.05+0.05		87Ka40
6225(15)			119							75Ca07
6277(10)	X ⁺		64				1	0.13		87Ka40
6326(15)			29							75Ca07
6374(15)			53							75Ca07
6406(8)	X ⁺		23				1+3	0.04+0.03		87Ka40
6472(15)			23							75Ca07
6519(8)	X ⁺		61				3	0.12		87Ka40
6557(15)			174							75Ca07
6590(15)			60							75Ca07
6640(15)	1^+-3^+	2	63							75Ca07
6675(15)			74							75Ca07
6744(15)			248							75Ca07
6809(15)			45							75Ca07
6844(15)			90							75Ca07
6887(12)			81							75Ca07
6919(15)			63							75Ca07
7110(25)										
7311.22(3)										
7540(25)										

(continued)

⁵²₂₃V

E^*	J^π	L	$d\sigma/d\Omega$	σ (τ, p)	L	$(2J+1)S$	L	C^2S'	$T_{1/2}$ or	Ref.
[keV]		(τ, p)	$\mu\text{b/sr}$	$\mu\text{b/sr}$	(d, p)	<i>rel.</i>	(t, d)	(t, d)	Γ_{cm}	
7850(25)										
8050(25)										
8250(25)										
8400(25)										
8760(25)										
8838(15)*	0 ⁺	0	615	368(50)						75Ca07
9060(25)										
9310(25)										
9510(25)										
10080(25)										
10650(25)										
			75Ca07	74Ha55		65Ca09		87Ka40		Ref.

Additional data on this isotope can be found in [91Mi08].

* Identified [89Hu13, 75Ca07] as IAS of ⁵²Ti ground state.

** Antianalog state [74Ha55].

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

Energy levels and branching ratios [00Hu06]. Part 2

⁵²₂₃V

E^*	J^π	Branching ratios in percentage										
		E_f^* :	0.0	17.2	22.8	142	148	437	793	846	1290	1419
[keV]		J_f^π :	3 ⁺	2 ⁺ , 3 ⁺	$\langle 5 \rangle^+$	1 ⁺	4 ⁺	2 ⁺	3 ⁺	4 ⁺	$\langle 1 \rangle^+$	3 ⁺
17.156(6)	2 ⁺ , 3 ⁺		100									
22.764(3)	$\langle 5 \rangle^+$		100									
141.611(6)	1 ⁺			100								
147.845(3)	4 ⁺		15(3)		85(17)							
436.635(9)	2 ⁺		46(10)	32		22						
793.55(1)	3 ⁺		21(4)	0.9(2)			77	0.9				
845.94(1)	4 ⁺		41(9)		52(10)		7(2)					
1289.85(2)	$\langle 1 \rangle^+$			74(13)		26(5)						
1418.81(1)	3 ⁺		40(8)	40(8)			7(2)	11(2)		2.6(5)		
1493.1(2)	7 ⁺				100							
1558.85(2)	4 ⁺		83(16)	0.4(1)	0.8(2)		2.2(5)			13(2)		
1579.16(4)			100									
1732.57(2)	3 ⁻ , 4 ⁻		33(7)		26(5)	1.5(3)	8(2)			33(7)		
1759.62(2)	3 ⁺			13(3)		2.3(4)	44(9)	40(8)	1.0(2)			
1770.17(2)					18(4)		38(8)	45(8)				
1795.12(2)	2 ⁺		3.2(6)	40(8)		1.5(3)	0.3(1)	38(7)	14(3)		2.5(5)	
2100.83(1)	3 ⁺		11(1)	14(2)			26(5)	20(4)	14(3)	9(2)		6(1)
2168.64(2)	4 ⁺		5.1(5)	1.7(2)	68(6)		11(1)		4.2(8)	10		
2318.03(3)	3 ⁺		24(2)	10(1)			23(2)		13(3)	12(2)		16(3)
2427.66(2)	2 ⁺ , 3 ⁺		16(2)	39(4)		12(1)		0.9(2)	32(7)			

(continued)

⁵²₂₃V

E^* [keV]	J^π	$E_f^*:$ $J_f^\pi:$	Branching ratios in percentage									
			0.0 3 ⁺	17.2 2 ⁺ , 3 ⁺	22.8 <5> ⁺	142 1 ⁺	148 4 ⁺	437 2 ⁺	793 3 ⁺	846 4 ⁺	1290 <1> ⁺	1419 3 ⁺
2538.82(2)	<3-5> ⁺				58(6)				3.5(7)	16(3)		5.0(10)
2559.38(5)			25(2)			24(2)		51(5)				
2743.05(5)			52(5)	27(3)		10(1)				5.1(8)		
2775.88(4)	X ⁺			72(7)						22(4)	6.3(11)	
2824.58(3)				40(4)				49(5)	11(1)			
2858.88(3)	<2-4> ⁺		1.4(1)	29(3)			17(1)	49	3.5(3)			
2910.38(5)	X ⁺		30(3)					70(8)				
2987.29(3)			54(5)	32(3)			10(1)	4.6(4)				
3009.15(6)	X ⁺		12(1)				18(2)		9.4(7)	60(6)		
3059.54(4)	<2,3> ⁺		27(1)					28(3)	11(1)		31(6)	3.3(7)
3184.31(4)			3.4(5)					7.3(9)	45(5)	17(1)	5.8(10)	22(5)
3194.27(2)	4 ⁺				2.2(1)		13(1)			5.4(5)		42(8)
3198.91(6)			6.5(7)		50(2)		32(2)			12(2)		
3315.20(6)	X ⁺		19(1)		33(1)					47(4)		
3333.19(5)			48(2)		9.4(4)			7.7(9)				19(4)
3450.04(5)	X ⁻			4.0(4)	37(2)				37(4)			
3473.79(6)	X ⁺		35(2)				5(1)			37(3)		15(1)
3538.51(5)	<1,2> ⁻						36(2)	51(3)	5.3(4)	7.5(8)		
3575.97(4)	3 ⁺			35(2)				36(2)				
3644.97(6)	X ⁺		20(1)		43(3)				27(3)	11(1)		
3729.61(5)	3 ⁺				37(1)					27(3)	6.0(6)	
3733.15(3)	X ⁺			47(2)		1.2(2)	1.9(2)	12.3(7)	12(1)		2.3(2)	2.3(2)
3777.09(3)	X ⁻		2.4(2)	3.6(2)	25(1)		13(1)	0.8(2)		26(3)		
3808.51(3)	1 ⁺ -3 ⁺				6.8(3)				22(1)	29.9(5)		
4108.70(5)			8.4(5)	6.0(5)		8.4(5)		60(3)			7.0(10)	
4278.70(4)	X ⁻				10(1)		27(1)		12.4(5)	5.0(5)		
4285.26(6)			43(2)	5.2(9)			12(1)		22.8(9)			
4419.58(6)								8.8(4)				
4483.0(1)				39(2)		15(1)		2.2(5)				
4518.9(1)							9.6(6)		15.8(6)			
4609.4(1)	1 ⁺				14(1)		6(1)		4.4(5)			
4755.0(1)							15(2)	8(2)				
5038.9(1)			5.3(3)		16(1)					66(3)		

Energy levels and branching ratios [00Hu06]. Part 3

⁵²₂₃V

E^* [keV]	J^π	$E_f^*:$ $J_f^\pi:$	Branching ratios in percentage									
			1493 7 ⁺	1559 4 ⁺	1579	1733 <3 ⁻ , 4 ⁻ >	1760 3 ⁺	1770	1795.1 2 ⁺	2100.8 3 ⁺	2168.6 4 ⁺	2318.0 3 ⁺
2100.83(1)	3 ⁺			0.5(1)								
2538.82(2)	<3-5> ⁺			9(2)		9(2)						
2543.0(3)	<9> ⁺		100									

(continued)

⁵²₂₃V

E^* [keV]	J^π	Branching ratios in percentage										
		E_f^* : J_f^π :	1493 7 ⁺	1559 4 ⁺	1579	1733 3 ⁻ , 4 ⁻	1760 3 ⁺	1770	1795.1 2 ⁺	2100.8 3 ⁺	2168.6 4 ⁺	2318.0 3 ⁺
2743.05(5)								5.1(8)				
2858.88(3)	2-4 ⁺									0.8(1)		
3194.27(2)	4 ⁺			11(2)				13(3)	1.9(4)	5(1)		
3333.19(5)							10(2)		6(1)			
3450.04(5)	X ⁻			4.8(8)								16(3)
3473.79(6)	X ⁺				8(1)							
3575.97(4)	3 ⁺				5(1)							
3729.61(5)	3 ⁺					10(2)						
3733.15(3)	X ⁺						9(2)				12(2)	
3777.09(3)	X ⁻			2.8(2)				25(3)				
3808.51(3)	1 ⁺ -3 ⁺			5.5(5)		8(1)		24(2)				
4108.70(5)					4.6(5)				6.0(5)			
4278.70(4)	X ⁻					5.9(5)					35(4)	
4285.26(6)					4.4(9)							
4419.58(6)							2.2(4)	3.9(4)		63(6)		
4483.0(1)					5.9(5)		14(2)			10(1)		
4518.9(1)						8(1)			15(2)	18(2)		
4609.4(1)	1 ⁺					3.8(5)		15(2)				
4755.0(1)						20(2)					24(2)	
5038.9(1)				4.6(3)								

Energy levels and branching ratios [00Hu06]. Part 4

⁵²₂₃V

E^* [keV]	J^π	Branching ratios in percentage										
		E_f^* : J_f^π :	2427.7 2 ⁺ , 3 ⁺	2538.8	2559.4	2743.0	2775.9 X ⁺	2824.6	2858.9	2910.4 X ⁺	3059.5 2, 3 ⁺	3184.3
3194.27(2)	4 ⁺			5.2(10)								
3575.97(4)	3 ⁺		24(5)									
3729.61(5)	3 ⁺		20(4)									
3808.51(3)	1 ⁺ -3 ⁺					4(1)						
4278.70(4)	X ⁻			5(1)								
4285.26(6)					12(3)							
4419.58(6)					1.8(4)		9(2)			11(2)		
4483.0(1)						5(1)				10(2)		
4518.9(1)				34(7)								
4609.4(1)	1 ⁺			34(3)			18(4)		4(1)			
4755.0(1)											32(7)	
5038.9(1)								5.6(7)				2.6(7)

Energy levels and branching ratios [99Hu14].

⁵³V
23

E^*	$2J^\pi$	ε	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]		(t,p)	Γ_{cm}		$E^*_\text{f}:$ $2J^\pi_\text{f}:$	0.0 7 ⁻	128 (5) ⁻	228 (3) ⁻	1091 11 ⁻	1550 (1,3) ⁻
0.0	7 ⁻	0.53	1.60(4) m	81Ma12						
127.60(8)	(5) ⁻	0.20	≤0.7 ns	81Ma12		100				
228.41(8)	(3) ⁻	0.22	4.0(3) ns	81Ma12		66	34(2)			
1091.2(2)	11 ⁻	0.85	2.0(3) ps	81Ma12		100				
1266.0(9)	(7,9) ⁻	0.42	>1.1 ps	81Ma12		63(8)	28(8)		9(2)	
1549.6(8)	(1,3) ⁻	0.31	0.08(+9-5) ps	81Ma12			64(10)	36(7)		
1653(4)	(9,11) ⁻	0.13	>0.45 ps	81Ma12		100				
1852(4)	7 ⁻	0.28		81Ma12						
1904.0(2)	(5) ⁻	0.49		81Ma12		30(2)	10(1)	61(7)		
1957.6(6)	(1 ⁻)		<0.03 ps					100		
2084.0(5)	(3) ⁻	0.09		81Ma12			52(7)	48(8)		
2332(8)	X ⁻									
2357(8)	X ⁻									
2420.4(3)	15 ⁻		0.9(2) ps						100	
2421(8)	(7 ⁻)									
2524(8)	7 ⁻									
2550.6(14)	(1) ⁻									100
2584.0(4)	(1,3) ⁻						36(4)	21(4)		17(6)
2636(8)	X ⁺									
2706(8)	(7 ⁻)									
2772(8)	X ⁻									
2829.5(4)	(5) ⁻					18(3)	26(5)	56(7)		
2888(8)	X ⁺									
2930.5(20)	(1) ⁻							100		
2967(8)	X ⁻									
3062(8)										
3107(8)										
3158(8)	X ⁻									
3263(8)										
3320(8)										
3348(8)										
3411(8)										
3492(8)										
3520(8)										
3573(8)										
3661(8)										
3692(8)										
3738(8)										
3784(8)										
3841(8)										
3947(8)										
3999(8)										
4042(8)										
4085.2(6)	(17,19 ⁻)		>0.7 ps							
4097(8)										

(continued)

⁵³V
23

E^*	$2J^\pi$	ε	$T_{1/2}$ or	Ref.	Branching ratios in percentage					
[keV]		(t,p)	Γ_{cm}		E_{f}^* : $2J_{\text{f}}^\pi$:	0.0 7 ⁻	128 $\langle 5 \rangle^-$	228 $\langle 3 \rangle^-$	1091 11 ⁻	1550 $\langle 1,3 \rangle^-$
4143(8)										
4187(8)										
4218(8)										
4263(8)										
4306(8)										
4345(8)										
4392(8)										
4428(8)										
4497(8)										
4593(8)										
4669(8)										
		81Ma12		Ref.						

The enhancement factor ε is a measure of how well the data for two-neutron transfer reaction (t,p) are described by DWBA-theory [81Ma12]; see transfer spectroscopic amplitudes therein. The only transition from the level at 4085 keV is observed to the level at 2420 keV.

Energy levels and branching ratios [99Hu14]. Part 2

⁵³V
23

E^*	$2J^\pi$	Branching ratios in percentage	
[keV]		1904 $\langle 5 \rangle^-$	2420 15 ⁻
2584.0(4)	$\langle 1,3 \rangle^-$	27(5)	
4085.2(6)	$\langle 17,19 \rangle^-$		100

Energy levels and branching ratios [87Wa04, 93Hu04].

⁵⁴V
23

E^*	J^π	L	σ (t, τ)	$T_{1/2}$ or	Ref.	Branching ratios in percentage				
[keV]		(t, τ)	$\mu\text{b/sr}$	Γ_{cm}		E_{f}^* : J_{f}^π :	0.0 3 ⁺	244.65 $\langle 4 \rangle$	1214.61 $\langle 5 \rangle$	1828.9 $\langle 6 \rangle$
0.0	3 ⁺		2.0(6)	49.8(5) s	85Aj03					
108	5 ⁺			0.9 μs			x			
116(5)			3.9(12)		85Aj03					
244.65(11)	$\langle 4 \rangle$		4.9(15)		85Aj03		100			
291(10)										
447(8)			1.4(5)		85Aj03					
495(10)										
540(8)										
703(10)			0.9(4)		85Aj03					
745(8)			2.4(9)		85Aj03					

(continued)

⁵⁴V
23

E^*	J^π	L	σ (t, τ)	$T_{1/2}$ or	Ref.	E_f^* :	Branching ratios in percentage			
[keV]		(t, τ)	$\mu\text{b/sr}$	Γ_{cm}		J_f^π :	0.0	244.65	1214.61	1828.9
							3 ⁺	$\langle 4 \rangle$	$\langle 5 \rangle$	$\langle 6 \rangle$
770(10)										
847(10)										
940(15)			1.9(7)		85Aj03					
968(15)			1.4(8)		85Aj03					
1208(20)			1.6(5)		85Aj03					
1214.61(19)	$\langle 5 \rangle$							100		
1540(20)										
1675(15)			2.1(9)		85Aj03					
1752(15)										
1828.9(3)	$\langle 6 \rangle$							53	47	
1865(15)										
1934(20)										
1987(15)										
2123(15)										
2297.9(3)	$\langle 7 \rangle$		1.4(4)	>0.35 ps	85Aj03				42	58
2400(15)										
2435(15)										
2487(10)			2.8(8)		85Aj03					
			85Aj03		Ref.					

Additional data on this isotope can be found in [77Fl03].

Values σ (t, τ) are relative to that for the first excited state in ⁵⁶Mn with $E^*=111$ keV [85Aj03].