^{150}Nd(^{30}Si,4nγ) 1996Cr02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 107, 791 (2006)	15-Sep-2005

Other: 1994Cr03.

Target: Pure ^{150}Nd. Projectile: ^{30}Si pulsed beam of <1 ns duration, separated by 82 ns, E=133 MeV. Detector: Argonne-Notre Dame BGO gamma ray facility, consists of 12 Compton-suppressed Ge detector and an inner array of 50 BGO elements. Measured: Eγ, Iγ, DCO ratio (not presented), $T_{1/2}$.

^{176}W Levels

E(level)[†]	J$^{\pi}$[‡]
0.0[a]	0$^+$
107.80[a] 19	2$^+$
347.5[a] 3	4$^+$
698.3[a] 3	6$^+$
1138.7[a] 3	8$^+$
1301.1[d] 3	4$^{(-)}$
1394.6[@] 3	6$^+$
1399.6[c] 3	5$^{(-)}$
1575.0[d] 3	6$^{(-)}$
1647.1[a] 4	10$^+$
1656.0[h] 4	6$^{(+)}$
1671.8[c] 3	7$^{(-)}$
1757.5[@] 4	8$^+$
1856.7[f] 5	7
1923.9[d] 3	8$^{(-)}$
1924.1[h] 4	8$^{(+)}$
1939.0[g] 6	(7)
1971.9[e] 6	8$^{(-)}$
1994.7[g] 6	
2006.4[c] 3	9$^{(-)}$
2148.7[f] 5	9
2159.3? 6	
2188.2[@] 4	10$^+$
2204.9[a] 4	12$^+$
2263.9[h] 5	10$^{(+)}$
2263.9+x	
2306.8[d] 4	10$^{(-)}$
2344.4[g] 8	(9)
2408.0[c] 4	11$^{(-)}$
2412.9[e] 5	10$^{(-)}$
2465.8+x[i]	(13)
2523.3[f] 6	11
2623.0[&] 4	12$^+$
2652.1+x[i]	(14)
2707.6[h] 6	12$^{(+)}$
2752.3[d] 4	12$^{(-)}$
2776.0[g] 10	(11)
2800.8[a] 4	14$^+$
2829.2[@] 5	12$^+$

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^{150}Nd(^{30}Si,4nγ) 1996Cr02 (continued)

^{176}W Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	$T_{1/2}$	Comments
2861.2? *5*			
2870.5+x[i]	(15)		
2880.1[c] *4*	13$^{(-)}$		
2886.0[e] *7*	12$^{(-)}$		
2970.0[f] *6*	13		
3031.5[&] *4*	14^{+}		
3118.4+x[i]	(16)		
3227.2? *6*			
3238.1[h] *7*	14$^{(+)}$		
3254.8 *5*			
3270.8[g] *11*	(13)		
3274.4[d] *5*	14$^{(-)}$		
3300.8? *4*			
3393.1+x[i]	(17)		
3398.2[e] *9*	14$^{(-)}$		
3420.5[c] *5*	15$^{(-)}$		
3426.1[a] *4*	16^{+}		
3483.4[f] *6*	15		
3492.4[&] *4*	16^{+}		
3694.4+x[i]	(18)		
3745.8[#] *4*	14^{+}	35 ns *10*	$T_{1/2}$: Measured with a recoil-shadow geometry from 716-, 491-, and 408-keV γ(t) spectra, using ^{50}Ti(^{130}Te,4nγ) reaction reported in 1996Cr02. ≈70 ns in 1994Cr03.
3816.5[g] *13*	(15)		
3844.2[d] *5*	16$^{(-)}$		
3951.5[e] *10*	16$^{(-)}$		
3968.7[#] *4*	15^{+}		
4000.9[&] *5*	18^{+}		
4020.4+x[i]	(19)		
4021.3[c] *5*	17$^{(-)}$		
4060.1[f] *6*	17		
4100.4 *4*			
4120.0[a] *6*	18^{+}		
4207.1[#] *5*	16^{+}		
4367.0 *5*			
4417.2[g] *16*	(17)		
4451.9[d] *5*	18$^{(-)}$		
4463.4[#] *5*	17^{+}		
4577.5 *5*			
4611.9[&] *5*	20^{+}		
4669.3[c] *6*	19$^{(-)}$		
4694.0[f] *7*	19		
4739.5[#] *5*	18^{+}		
4838.3[a] *9*	20^{+}		
4893.3[b] *6*		≈10 ns	$T_{1/2}$: From 1996Cr02.
5033.1[#] *5*	19^{+}		
5081.6[d] *7*	20$^{(-)}$		
5191.1[b] *6*			
5297.4[&] *6*	22^{+}		

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^{150}Nd(^{30}Si,4nγ) 1996Cr02 (continued)

^{176}W Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
5341.7# 5	20+	5605.6a 11	22+	5999.0# 7	22+	6546.2b 8	
5355.0c 8	21(−)	5664.2# 6	21+	6049.5& 7	24+	6707.6# 10	24+
5368.7f 7	21	5731.6d 7	22(−)	6184.4b 7		6857.5& 8	26+
5504.8b 6		5836.6b 6		6347.0# 7	23+	6920.0b 9	

† Deduced by evaluator from a least-squares fit to γ-ray energies.
‡ Jπ assignments are based on directional correlation from oriented states (DCO) ratios and on rotational structure. Quadrupole transitions were found to have DCO ratios of about 0.95, and dipole transitions of about 0.45.
# Kπ=14+ band, possible configuration π7/2[404]⊗π9/2 [514]⊗ν7/2[633]⊗ν5/2[512].
@ Kπ=(0^+_2) band: first excited state band.
& Kπ=(0+) s band: two rotation-aligned neutrons band.
a Kπ=0+ g.s. rotational band.
b Rotational band.
c Kπ=4− band: configuration π1/2[541]⊗π7/2[404].
d Kπ=4− band: configuration π1/2[541]⊗π7/2[404].
e Kπ=8− band: configuration π9/2[514]⊗π7/2[404].
f K=7 band: configuration Π9/2[514]⊗Π5/2[402].
g K=(7) band.
h Kπ=6+ band: configuration ν5/2[512]⊗ν7/2[514].
i K=(13) band.

γ(^{176}W)

Eγ	Iγ†	Ei(level)	Jiπ	Ef	Jfπ	α‡	I(γ+ce)
107.8 1		107.80	2+	0.0	0+	2.81	25
174.2 3	0.6 1	1575.0	6(−)	1399.6	5(−)		
186.3 2	0.7 2	2652.1+x	(14)	2465.8+x	(13)		
202.1 6	≈0.1	2465.8+x	(13)	2263.9+x			
210.5 1	0.07	4577.5		4367.0			
218.0 4	0.5 2	2870.5+x	(15)	2652.1+x	(14)		
x219.0 4	0.6 2						
222.8 1	1.1 2	3968.7	15+	3745.8	14+		
230.7 1	1.0 2	3031.5	14+	2800.8	14+		
238.2 1	0.9 2	4207.1	16+	3968.7	15+		
239.7 1	82 6	347.5	4+	107.80	2+		
247.7 2	0.6 2	3118.4+x	(16)	2870.5+x	(15)		
251.9 3	0.5 1	1923.9	8(−)	1671.8	7(−)		
256.2 1	0.6 1	4463.4	17+	4207.1	16+		
266.6 1	0.44 8	4367.0		4100.4			
267.6 2	0.8 1	1924.1	8(+)	1656.0	6(+)		
272.3 1	0.6 1	1671.8	7(−)	1399.6	5(−)		
273.9 1	3.0 2	1575.0	6(−)	1301.1	4(−)		
275.0 2	0.6 2	3393.1+x	(17)	3118.4+x	(16)		
275.9 1	0.5 1	4739.5	18+	4463.4	17+		
292.0 1	1.3 1	2148.7	9	1856.7	7		
293.5 1	0.3 1	5033.1	19+	4739.5	18+		
297.8 1	0.20 4	5191.1		4893.3			
300.6 3	0.4 1	2306.8	10(−)	2006.4	9(−)		

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^{150}Nd(^{30}Si,4nγ) 1996Cr02 (continued)

$\gamma(^{176}W)$ (continued)

E_γ	I_γ †	E_i(level)	J_i^π	E_f	J_f^π
301.3 *3*	0.5 *1*	3694.4+x	(18)	3393.1+x	(17)
308.6 *1*	0.3 *1*	5341.7	20^+	5033.1	19^+
313.7 *1*	0.23 *5*	5504.8		5191.1	
315.8 *1*	0.28 *6*	4893.3		4577.5	
322.4 *2*		5664.2	21^+	5341.7	20^+
326.0 *4*	0.3 *1*	4020.4+x	(19)	3694.4+x	(18)
331.7 *1*	0.27 *5*	5836.6		5504.8	
334.6 *1*	3.4 *2*	2006.4	$9^{(-)}$	1671.8	$7^{(-)}$
334.8 *4*	0.11 *4*	5999.0	22^+	5664.2	21^+
339.8 *2*	0.6 *1*	2263.9	$10^{(+)}$	1924.1	$8^{(+)}$
347.6 *3*		6184.4		5836.6	
348.2 *2*		6347.0	23^+	5999.0	22^+
348.8 *1*	5.5 *3*	1923.9	$8^{(-)}$	1575.0	$6^{(-)}$
350		2344.4	(9)	1994.7	
350.8 *1*	79 *2*	698.3	6^+	347.5	4^+
354.6 *1*	0.8 *2*	4100.4		3745.8	14^+
359.0 *3*	0.7 *1*	2006.4	$9^{(-)}$	1647.1	10^+
362.1 *3*		6546.2		6184.4	
363.0 *2*	0.5 *1*	1757.5	8^+	1394.6	6^+
374.0 *3*		6920.0		6546.2	
374.6 *1*	2.9 *2*	2523.3	11	2148.7	9
382.8 *1*	4.1 *3*	2306.8	$10^{(-)}$	1923.9	$8^{(-)}$
397.0 *3*	0.7 *2*	1971.9	$8^{(-)}$	1575.0	$6^{(-)}$
401.6 *1*	5.5 *3*	2408.0	$11^{(-)}$	2006.4	$9^{(-)}$
405.0# *3*	<0.1	2870.5+x	(15)	2465.8+x	(13)
405.4 *3*	0.7 *2*	2344.4	(9)	1939.0	(7)
408.4 *1*	2.8 *2*	3031.5	14^+	2623.0	12^+
418.0 *1*	2.0 *6*	2623.0	12^+	2204.9	12^+
430.8 *2*	0.9 *2*	2188.2	10^+	1757.5	8^+
431.6 *3*	1.3 *2*	2776.0	(11)	2344.4	(9)
434.7 *1*	2.3 *2*	2623.0	12^+	2188.2	10^+
440.4 *1*	56 *2*	1138.7	8^+	698.3	6^+
441.0 *3*	1.8 *4*	2412.9	$10^{(-)}$	1971.9	$8^{(-)}$
443.7 *1*	0.7 *3*	2707.6	$12^{(+)}$	2263.9	$10^{(+)}$
445.0 *1*	0.25 *6*	3745.8	14^+	3300.8?	
445.5 *1*	4.4 *2*	2752.3	$12^{(-)}$	2306.8	$10^{(-)}$
446.7 *1*	3.0 *2*	2970.0	13	2523.3	11
460.9 *1*	1.8 *4*	3492.4	16^+	3031.5	14^+
461.7 *2*	0.27 *5*	4207.1	16^+	3745.8	14^+
466.5 *5*	0.2 *2*	3118.4+x	(16)	2652.1+x	(14)
472.1 *1*	6.0 *2*	2880.1	$13^{(-)}$	2408.0	$11^{(-)}$
473.1 *3*	1.6 *3*	2886.0	$12^{(-)}$	2412.9	$10^{(-)}$
489.0 *3*	1.1 *3*	2412.9	$10^{(-)}$	1923.9	$8^{(-)}$
490.9 *2*	0.4 *1*	3745.8	14^+	3254.8	
494.8 *3*	1.0 *2*	3270.8	(13)	2776.0	(11)
494.9 *1*	0.39 *5*	4463.4	17^+	3968.7	15^+
508.4 *1*	46 *2*	1647.1	10^+	1138.7	8^+
508.8	1.8 *5*	4000.9	18^+	3492.4	16^+
512.2 *3*	0.05 *3*	2159.3?		1647.1	10^+
512.2 *3*	2.0 *4*	3398.2	$14^{(-)}$	2886.0	$12^{(-)}$
513.4 *1*	2.8 *5*	3483.4	15	2970.0	13
518.6 *3*	0.29 *6*	3745.8	14^+	3227.2?	
522.1 *1*	3.2 *2*	3274.4	$14^{(-)}$	2752.3	$12^{(-)}$
522.5 *5*	0.3 *2*	3393.1+x	(17)	2870.5+x	(15)
530.5 *2*	0.5 *3*	3238.1	$14^{(+)}$	2707.6	$12^{(+)}$
532.5 *1*	0.46 *6*	4739.5	18^+	4207.1	16^+
533.1 *1*	2.6 *4*	1671.8	$7^{(-)}$	1138.7	8^+
540.4 *1*	4.6 *3*	3420.5	$15^{(-)}$	2880.1	$13^{(-)}$
541.1 *1*	1.0 *2*	2188.2	10^+	1647.1	10^+
545.7 *3*	0.6 *2*	3816.5	(15)	3270.8	(13)
553.3 *3*	0.8 *2*	3951.5	$16^{(-)}$	3398.2	$14^{(-)}$
557.8 *1*	28 *2*	2204.9	12^+	1647.1	10^+
569.8 *1*	1.3 *3*	3844.2	$16^{(-)}$	3274.4	$14^{(-)}$
569.8 *2*	0.38 *5*	5033.1	19^+	4463.4	17^+
574.7 *1*	4.0 *6*	4000.9	18^+	3426.1	16^+
576.7 *1*	2.6 *6*	4060.1	17	3483.4	15
579.1 *5*	0.4 *1*	2886.0	$12^{(-)}$	2306.8	$10^{(-)}$
595.9 *1*	19 *1*	2800.8	14^+	2204.9	12^+
600.7 *5*	0.6 *2*	4417.2	(17)	3816.5	(15)
600.8 *1*	3.1 *4*	4021.3	$17^{(-)}$	3420.5	$15^{(-)}$
603.0 *2*	0.37 *6*	5341.7	20^+	4739.5	18^+
607.7 *1*	1.0 *1*	4451.9	$18^{(-)}$	3844.2	$16^{(-)}$
611.0 *1*	3.0 *5*	4611.9	20^+	4000.9	18^+
612.0 *4*	0.27 *5*	5504.8		4893.3	
618.8 *2*	1.4 *4*	1757.5	8^+	1138.7	8^+
624.0 *4*	1.0 *4*	2829.2	12^+	2204.9	12^+
625.3 *1*	8.8 *6*	3426.1	16^+	2800.8	14^+
628.0 *5*	1.6 *3*	4120.0	18^+	3492.4	16^+
629.7 *2*	0.7 *1*	5081.6	$20^{(-)}$	4451.9	$18^{(-)}$
631.1 *2*	0.29 *6*	5664.2	21^+	5033.1	19^+
632 *1*	0.07 *4*	3254.8		2623.0	12^+
633.9 *1*	1.2 *2*	4694.0	19	4060.1	17
641.2 *2*	0.5 *2*	2829.2	12^+	2188.2	10^+
647.9 *4*	0.18 *4*	5836.6		5191.1	
648.0 *2*	1.2 *2*	4669.3	$19^{(-)}$	4021.3	$17^{(-)}$
650.0 *1*	0.1 *1*	5731.6	$22^{(-)}$	5081.6	$20^{(-)}$
656.3 *2*	0.25 *6*	2861.2?		2204.9	12^+
657.6 *3*	0.26 *6*	5999.0	22^+	5341.7	20^+
674.7 *1*	0.7 *1*	5368.7	21	4694.0	19
680.2 *4*		6184.4		5504.8	
682.0 *4*		6347.0	23^+	5664.2	21^+
685.5 *2*	2.1 *7*	5297.4	22^+	4611.9	20^+
685.7 *3*	0.4 *1*	5355.0	$21^{(-)}$	4669.3	$19^{(-)}$
693.7 *3*	2.7 *3*	4120.0	18^+	3426.1	16^+
697.0 *2*	1.4 *2*	1394.6	6^+	698.3	6^+
701.4 *1*	2.2 *6*	1399.6	$5^{(-)}$	698.3	6^+
708.6 *4*	0.25 *6*	6707.6	24^+	5999.0	22^+
709.5 *4*	0.24 *5*	6546.2		5836.6	
714.1 *1*	0.8 *1*	3745.8	14^+	3031.5	14^+
717.4 *4*	0.5 *1*	1856.7	7	1138.7	8^+
718.3 *3*	1.5 *4*	4838.3	20^+	4120.0	18^+
735.0 *5*		6920.0		6184.4	
752.1 *2*	0.4 *1*	6049.5	24^+	5297.4	22^+
760.9 *1*	1.6 *3*	2408.0	$11^{(-)}$	1647.1	10^+
767.3 *4*	0.5 *2*	5605.6	22^+	4838.3	20^+
785.4 *1*	1.1 *1*	1923.9	$8^{(-)}$	1138.7	8^+
808.0 *1*	0.3 *1*	6857.5	26^+	6049.5	24^+
826.6 *1*	0.8 *1*	3031.5	14^+	2204.9	12^+

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^{150}Nd(^{30}Si,4nγ) 1996Cr02 (continued)

$\gamma(^{176}W)$ (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π
[x]866.0	<0.2					1047.0[#] *1*	0.6 *3*	1394.6	6^+	347.5	4^+
867.8 *1*	3.0 *4*	2006.4	$9^{(-)}$	1138.7	8^+	1049.8 *3*	0.21 *6*	3254.8		2204.9	12^+
876.4 *1*	5 *2*	1575.0	$6^{(-)}$	698.3	6^+	1067.9 *3*	0.16 *6*	3227.2?		2159.3?	
884.5 *2*	0.25 *6*	3745.8	14^+	2861.2?		1096.0 *1*	0.08 *3*	3300.8?		2204.9	12^+
916.8 *3*	0.31 *4*	3745.8	14^+	2829.2	12^+	[x]1122.0	<0.1				
945.0 *2*	0.15 *4*	3745.8	14^+	2800.8	14^+	1159.5 *4*	0.3 *1*	1856.7	7	698.3	6^+
953.7 *1*	2.7 *2*	1301.1	$4^{(-)}$	347.5	4^+	1225.9 *1*	3.2 *6*	1924.1	$8^{(+)}$	698.3	6^+
957.6 *1*	1.2 *1*	1656.0	$6^{(+)}$	698.3	6^+	1240.6 *3*	0.7 *2*	1939.0	(7)	698.3	6^+
973.4 *2*	2.2 *4*	1671.8	$7^{(-)}$	698.3	6^+	1296.4 *3*	0.9 *2*	1994.7		698.3	6^+
1010.0 *3*	1.2 *1*	2148.7	9	1138.7	8^+	[x]1541	<0.06				

[†] Intensities are relative to 100 for Ti(108γ).
[‡] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[#] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{150}Nd(^{30}Si,4nγ) 1996Cr02

Level Scheme

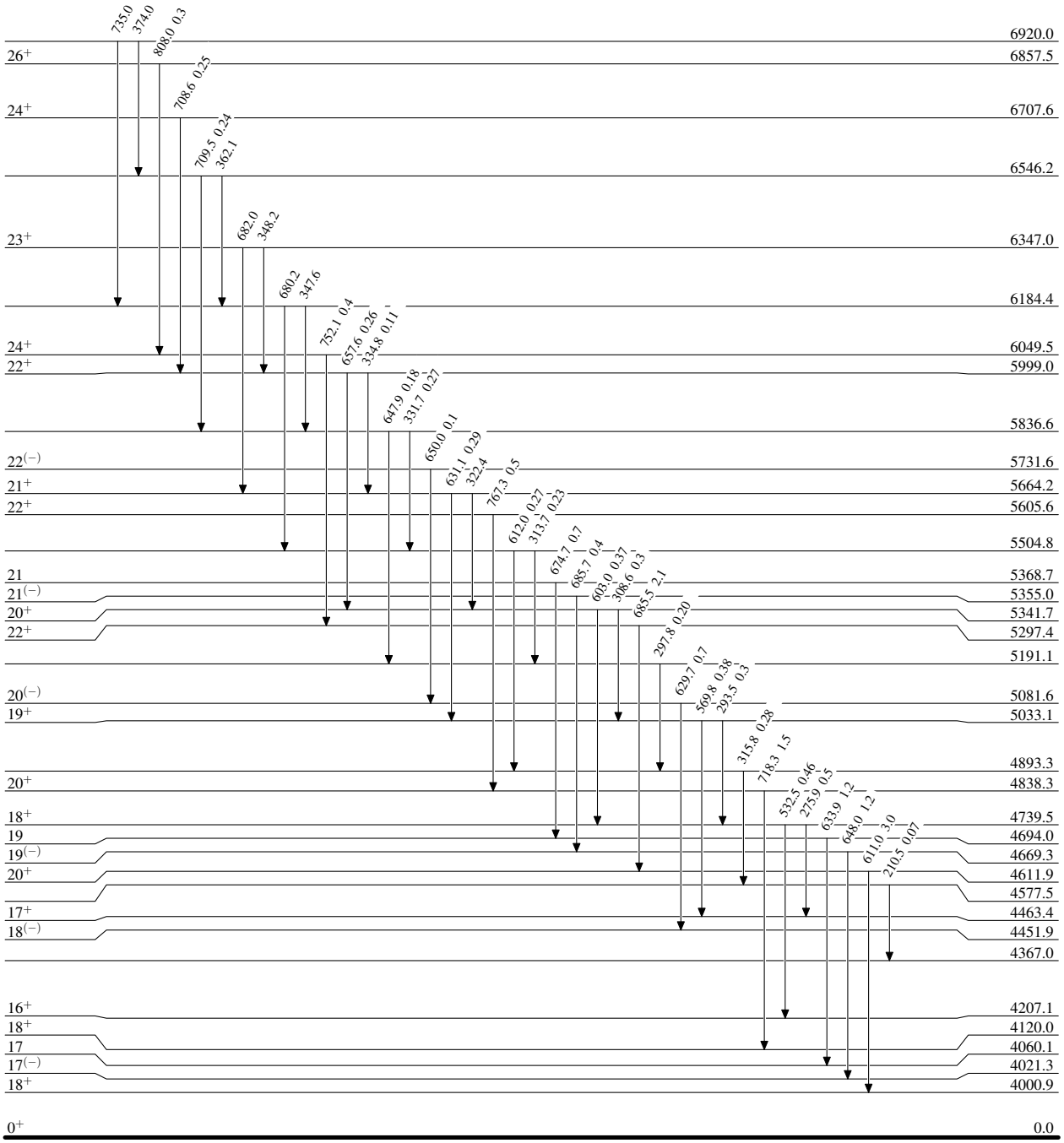
Intensities: Relative I_γ

Legend

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

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

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



$^{176}_{74}W_{102}$

^{150}Nd(^{30}Si,4nγ) 1996Cr02

Level Scheme (continued)

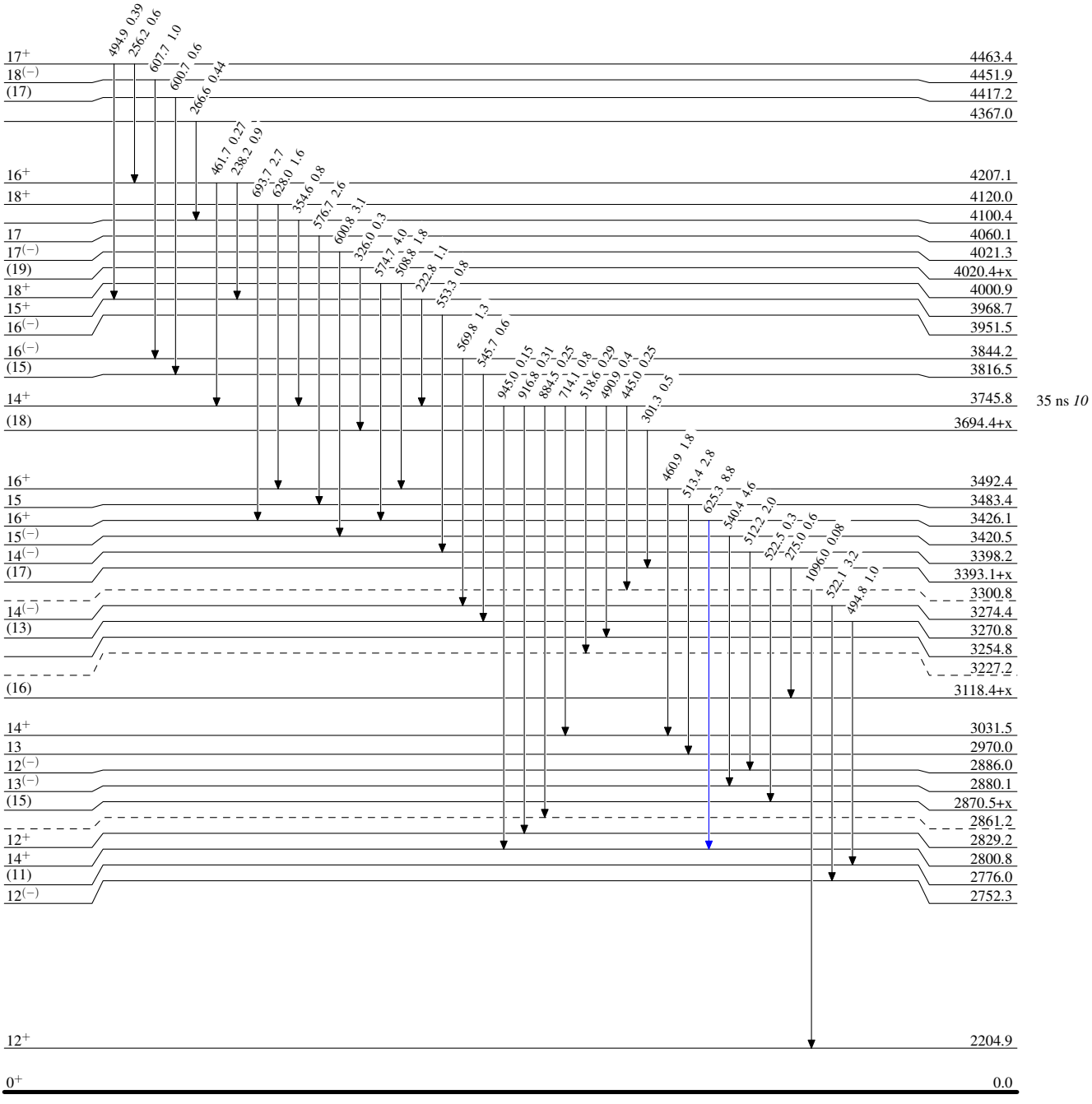
Intensities: Relative I_γ

Legend

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

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

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



$^{176}_{74}W_{102}$

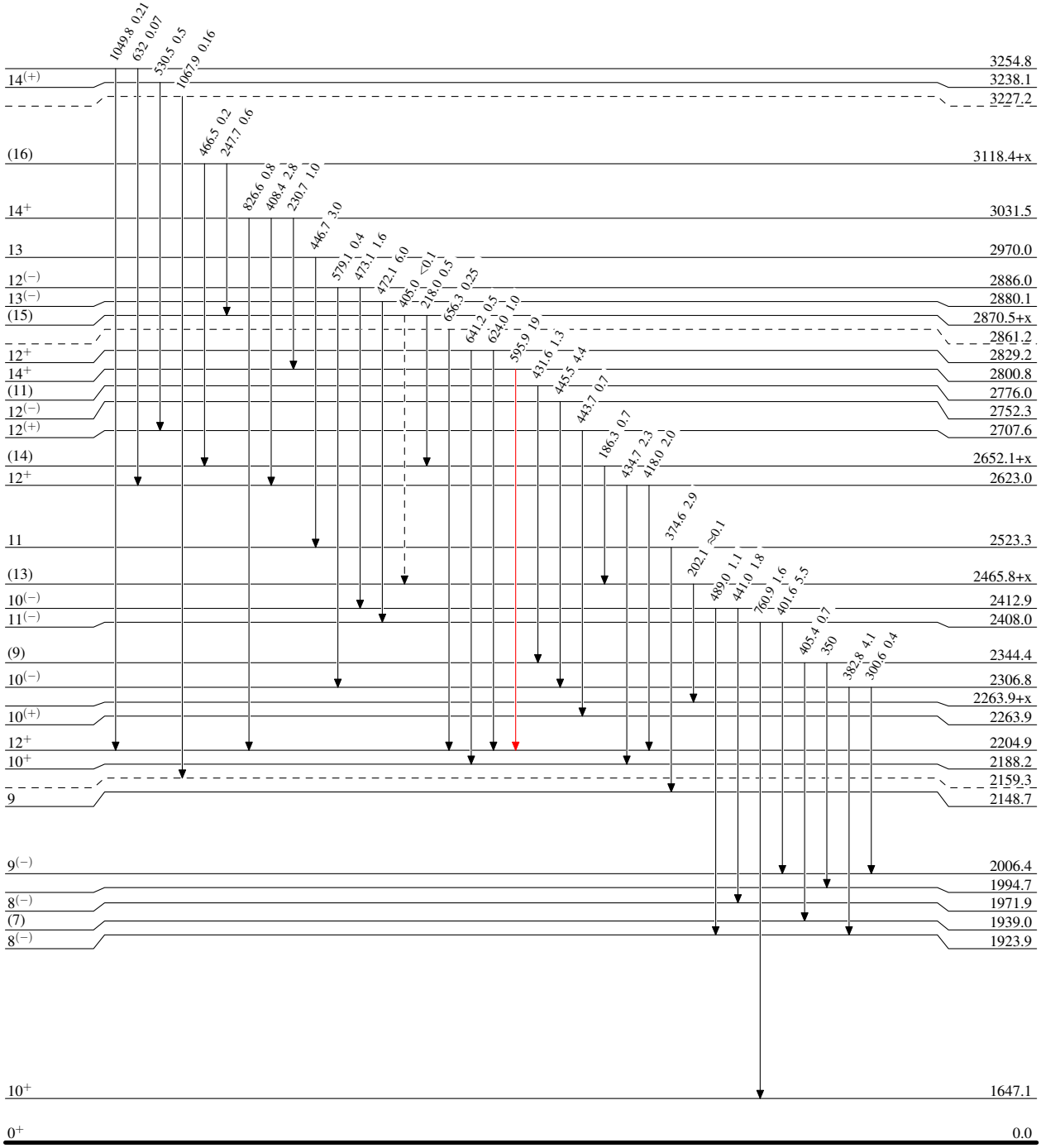
^{150}Nd(^{30}Si,4nγ) 1996Cr02

Level Scheme (continued)

Intensities: Relative I_γ

Legend

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



$^{176}_{74}W_{102}$

^{150}Nd(^{30}Si,4nγ) 1996Cr02

Level Scheme (continued)

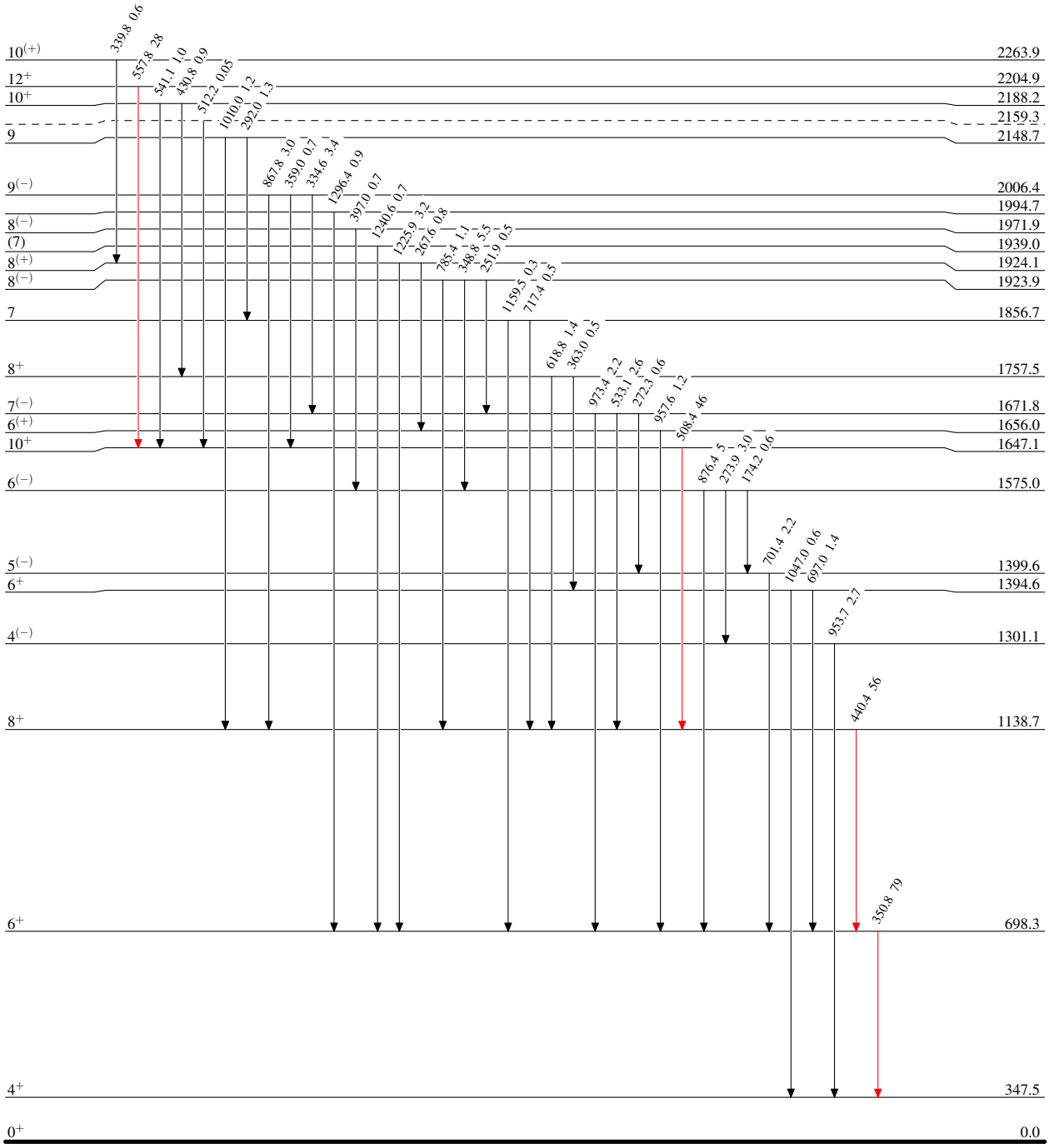
Intensities: Relative I_γ

Legend

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

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

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

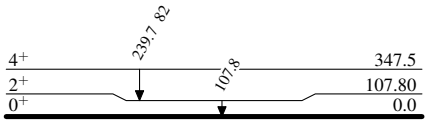


$^{176}_{74}W_{102}$

^{150}Nd(^{30}Si,4nγ) 1996Cr02

Level Scheme (continued)

Intensities: Relative I_γ



$^{176}_{74}W_{102}$