^{37}Cl(α,pγ) 1983Bi08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 140, 1 (2017)	30-Sep-2015

Includes ^{27}Al(^{18}O,p$\alpha\gamma$) at E=35 MeV and ^{25}Mg(^{18}O,n2pγ) at E=40 MeV from 1975Wa23.

1983Bi08: E=12, 13 MeV alpha beams were produced from the 7 MV Van de Graaff accelerator of the University of Freiburg. Targets were prepared by evaporating 120 μg/cm^2 AgCl (98% enriched in ^{37}Cl) onto a 15 μg/cm^2 carbon foil or a 1500 μg/cm^2 gold fold for lifetime measurements. Protons were detected with an annular ΔE-E telescope of two surface barrier detectors at 180° and γ rays were detected by a 120 cm^3 Ge(Li) detector at 55°. Measured Eγ, Iγ, pγ-coin, p$\gamma(\theta)$, γ(lin pol), Doppler-shift attenuation. Deduced levels, J, π, T$_{1/2}$, γ-ray branching ratios and mixing ratios, multipolarities, transition strengths.

Others:

1975Wa23: E=12 MeV. Measured Eγ, Iγ, recoil distance. Deduced lifetimes by recoil-distance method for 1461, 2893 and 3464 levels.

1975Po13: E=10.6 MeV. Measured Eγ, pγ(t). Deduced lifetime of 3464 level.

1971Ja15: E=6.25, 7.00, 8.00 MeV. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$, Doppler-shift attenuation. Deduced levels, J, π, T$_{1/2}$ for 1461, 2121, 2525, 2893, 3208 and 3515 levels.

1970Cu02: E=8.40 MeV. Measured Eγ, Doper-shift attenuation. Deduced T$_{1/2}$ for 1461 level.

All data are from 1983Bi08, unless otherwise noted.

^{40}Ar Levels

E(level)[†]	J$^\pi$[#]	T$_{1/2}$[&]	Comments
0[a]	0$^+$		
1460.849[‡a] *5*	2$^+$	1.09 ps *28*	T$_{1/2}$: weighted average of 1.39 ps *28* (1983Bi08) and 0.83 ps *26* (1971Ja15). Other: 1.7 ps *+125−9* (1970Cu02).
2121[b] *1*	0$^+$	>2.8 ps	T$_{1/2}$: other: 6.2 ps *+90−28* (1971Ja15).
2524[b] *1*	2$^+$	0.24 ps *4*	T$_{1/2}$: weighted average of 0.27 ps *4* (1983Bi08) and 0.19 ps *5* (1971Ja15).
2892.68[‡a] *10*	4$^+$	2.3 ps *6*	T$_{1/2}$: weighted average of 2.2 ps *6* (1983Bi08) and 2.9 ps *14* (1975Wa23). Other: 2.8 ps *+56−14* (1971Ja15).
3208 *1*	2$^+$	28 fs *14*	
3464.59[‡a] *13*	6$^+$	0.680 ns *21*	T$_{1/2}$: weighted average of 0.693 ns *21* from direct timing pγ(t) (1975Po13) and 0.645 ns *35* from recoil-distance method (1975Wa23). Others: >2.8 ps (1983Bi08).
3511 *1*	1,2$^+$	49 fs *14*	
3515[b] *1*	4$^+$	0.139 ps *28*	
3681 *1*	3$^-$	0.132 ps *28*	
3919 *1*	2$^+$	0.28 ps *3*	
4041 *1*			
4082 *1*	2$^-$,3$^-$	40 fs *14*	
4226 *1*	4$^{(-)}$	>2.8 ps	
4229 *1*		0.166 ps *28*	
4300 *1*	1$^-$,2$^-$,3$^-$	58 fs *14*	
4328 *1*	1,2$^+$	18 fs *7*	
4420 *1*			
4427 *1*	(3$^+$,4$^+$)	125 fs *21*	J$^\pi$: 3$^+$,4,5$^+$ is given in 1983Bi08, but 4$^-$ and 5$^+$ should be ruled out by RUL for 2966γ to 2$^+$.
4473 *1*	1		
4494 *1*	5$^-$	0.50 ps *7*	
4562 *1*	1$^-$,2$^-$,3$^-$		
4578 *1*	3	37 fs *14*	J$^\pi$: 2$^+$,3 is given in 1983Bi08, but J^π=2$^+$ results in ΔJ=2 for the 1685γ to 4$^+$, which expects positive A$_2$ value while the measured A$_2$ by 1983Bi08 is negative.
4602 *1*		33 fs *14*	
4674 *1*		66 fs *17*	
4769 *1*	1,2		
4794 *1*	3$^+$,4$^+$	52 fs *14*	
4858 *1*	5$^-$	37 fs *10*	

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^{37}Cl(α,pγ) 1983Bi08 (continued)

^{40}Ar Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[&]	E(level)[†]	Jπ[#]	E(level)[†]	Jπ[#]
4929 *1*			5544 *2*		6013 *2*	(7^-)[@]
4959[b] *1*	6^+,$(5^+$,4)	0.10 ps *4*	5559 *2*		6099 *2*	
4972 *1*			5608 *2*		6104 *2*	
4991 *1*	$4^{(-)}$	2.1 ps *7*	5611 *2*		6138 *2*	
5115 *2*			5630 *2*		6158 *2*	
5143 *2*		<10 fs	5654 *2*		6185 *2*	
5166 *2*			5662 *2*		6203 *2*	
5245 *2*			5675 *2*		6270 *2*	
5269 *2*			5766 *2*		6305 *2*	
5293 *2*			5818 *2*		6356 *2*	
5310 *2*			5885 *2*		6806[b] *2*	(8^+)[@]
5350 *2*			5912 *2*		6979 *2*	(8^-)[@]
5378 *2*			5931 *2*			
5508 *2*			5973 *2*	(6^-)[@]		

[†] From 1983Bi08, uncertainty is 1 keV for levels below 5 MeV and 2 keV for other levels, unless otherwise noted.
[‡] Original values are from 1975Wa23 are based on Eγ(1461γ)=1460.81 *4*. Quoted values are deduced by the evaluator based on the Adopted Eγ(1461γ)=1460.820 *5*.
[#] From 1983Bi08 based on measured γ(θ) and γ(lin pol); the assignment for low-lying levels below E=2893 are from Adopted Levels, unless otherwise noted.
[@] From analog in ^{42}Ca (1983Bi08).
[&] From 1983Bi08 using DSAM, unless otherwise noted.
[a] Band(A): Member of $f^2_{7/2}$ yrast sequence.
[b] Band(B): 0^+ deformed band.

γ(^{40}Ar)

E_i(level)	J^π_i	E_γ[†]	I_γ[#]	E_f	J^π_f	Mult.[@]	δ[@]	Comments
1460.849	2^+	1460.820[‡] *5*	100	0	0^+			
2121	0^+	660	100	1460.849	2^+			
2524	2^+	1063	57 *1*	1460.849	2^+			
		2524	43 *1*	0	0^+			I_γ: Iγ(2524)/Iγ(1063)=38/62.
2892.68	4^+	1430.80[‡] *10*	100	1460.849	2^+			
3208	2^+	1747	90 *1*	1460.849	2^+			
		3208	10 *1*	0	0^+			
3464.59	6^+	571.91[‡] *8*	100	2892.68	4^+			A_2=+0.30 *2*, A_4=−0.09 *2* from ^{25}Mg(^{18}O,n2pγ) in 1975Wa23.
3511	$1,2^+$	987	5 *1*	2524	2^+			
		2050	81 *3*	1460.849	2^+			
		3511	14 *2*	0	0^+			
3515	4^+	622	31 *2*	2892.68	4^+	M1(+E2)	−0.07 *10*	A_2=+0.45 *3*, A_4=−0.04 *4*. Mult.: D(+Q) from γ(θ); E1(+M2) ruled out by RUL. δ: other: −0.4 to −1.3 for J=3.
		991	9 *5*	2524	2^+			
		2054	60 *2*	1460.849	2^+			
3681	3^-	788	10 *1*	2892.68	4^+			
		1157	4.0 *5*	2524	2^+			
		2220	86 *2*	1460.849	2^+			

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^{37}Cl(α,pγ) 1983Bi08 (continued)

$\gamma(^{40}Ar)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	δ[@]	Comments
3919	2^+	1395	13 *2*	2524	2^+			
		1798	9 *2*	2121	0^+			
		2458	18 *2*	1460.849	2^+			
		3919	60 *4*	0	0^+			
4041		1517	100	2524	2^+			
4082	$2^-,3^-$	2621	100	1460.849	2^+			
4226	$4^{(-)}$	545	47 *2*	3681	3^-	D+Q	−10 *+3−9*	A_2=−0.10 *3*, A_4=−0.09 *3*. POL=−0.03 *11*.
		1333	53 *2*	2892.68	4^+	D(+Q)	+0.6 *+4−8*	A_2=+0.34 *4*, A_4=+0.08 *4*. δ: other: −1.7 *+13−4* for J=3.
4229		1705	77 *3*	2524	2^+			
		2768	23 *3*	1460.849	2^+			
4300	$1^-,2^-,3^-$	2839	100	1460.849	2^+			
4328	$1,2^+$	2867	71 *5*	1460.849	2^+			
		4328	29 *5*	0	0^+			
4420		1212	9 *2*	3208	2^+			
		1896	8 *2*	2524	2^+			
		2959	83 *4*	1460.849	2^+			
4427	$(3^+,4^+)$	1534	43 *5*	2892.68	4^+	D+Q		A_2=+0.41 *4*, A_4=+0.03 *4*. δ: −0.34 to −1.8 for J=3; −0.2 to +1.0 for J=4; +0.32 to +0.77 for J=5.
		2966	57 *5*	1460.849	2^+			
4473	1	4473	100	0	0^+			
4494	5^-	268	1.8 *3*	4226	$4^{(-)}$			
		979	9 *1*	3515	4^+			
		1029	28 *2*	3464.59	6^+	D(+Q)	+0.06 *+7−10*	A_2=−0.17 *4*, A_4=−0.03 *4*.
		1601	61 *3*	2892.68	4^+	E1(+M2)	0.00 *+6−9*	A_2=−0.24 *3*, A_4=−0.03 *3*. POL=+0.58 *15*.
4562	$1^-,2^-,3^-$	480	9 *1*	4082	$2^-,3^-$			
		643	42 *4*	3919	2^+			
		3101	49 *4*	1460.849	2^+			
4578	3	1067	35 *4*	3511	$1,2^+$			
		1370	15 *2*	3208	2^+			
		1685	39 *4*	2892.68	4^+	D+Q		based on $\gamma(\theta)$, A_2=−0.21 *6*, A_4=+0.08 *6*, ΔJ=2 is ruled out since positive A_2 is expected. δ: −0.05 to +0.72 for J=3.
		3117	11 *2*	1460.849	2^+			
4602		274[&]		4328	$1,2^+$			1983Bi08 indicate that this transition could have escaped detection due to low energy.
		2078	90 *2*	2524	2^+			
		3141	10 *2*	1460.849	2^+			
4674		3213	100	1460.849	2^+			
4769	1,2	4769	100	0	0^+			
4794	$3^+,4^+$	1901	50 *5*	2892.68	4^+	M1+E2		A_2=+0.32 *4*, A_4=−0.07 *5*. δ: 0.22 *+13−5* or +1.60 *15* for J=4; −1.0 *6* for J=3.
		3333	50 *5*	1460.849	2^+			
4858	5^-	364	10.0 *5*	4494	5^-			
		1393	24 *1*	3464.59	6^+			
		1965	66 *2*	2892.68	4^+	E1(+M2)	−0.09 *+8−12*	A_2=−0.43 *4*, A_4=−0.04 *3*, POL=+0.71 *26*.
4929		1248	50 *4*	3681	3^-			
		2405	22 *3*	2524	2^+			
		3468	28 *3*	1460.849	2^+			
4959	$6^+,(5^+,4)$	1444	64 *3*	3515	4^+	E2		A_2=+0.30 *3*, A_4=−0.07 *4*.
		2066	36 *3*	2892.68	4^+	E2		A_2=+0.29 *5*, A_4=−0.07 *6*.

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^{37}Cl(α,pγ) 1983Bi08 (continued)

$\gamma(^{40}Ar)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	Comments
4972		2079	59 *4*	2892.68	4^+		
		3511	41 *4*	1460.849	2^+		
4991	$4^{(-)}$	765	83 *2*	4226	$4^{(-)}$	D+Q	A_2=+0.40 *3*, A_4=+0.04 *5*, POL>+0.65. δ(Q/D)=−0.13 to +0.77 or −0.72 to −1.5.
		909	9 *1*	4082	$2^-,3^-$		
		1310	8 *1*	3681	3^-		
5115		1650	100	3464.59	6^+		
5143		1628	17 *2*	3515	4^+		
		1678	83 *2*	3464.59	6^+		
5166		1651	70 *3*	3515	4^+		
		3705	30 *3*	1460.849	2^+		
5245		3784	100	1460.849	2^+		
5269		1588	100	3681	3^-		
5293		3832	100	1460.849	2^+		
5310		816	11 *1*	4494	5^-		
		1228	41 *3*	4082	$2^-,3^-$		
		1629	48 *3*	3681	3^-		
5350		2457	100	2892.68	4^+		
5378		1863	21 *2*	3515	4^+		
		1913	28 *2*	3464.59	6^+		
		2485	51 *4*	2892.68	4^+		
5508		1993	100	3515	4^+		
5544		4083	100	1460.849	2^+		
5559		2044	26 *2*	3515	4^+		
		2094	28 *2*	3464.59	6^+		
		2666	46 *4*	2892.68	4^+		
5608		4147	100	1460.849	2^+		
5611		2146	100	3464.59	6^+		
5630		1203	100	4427	$(3^+,4^+)$		
5654		3130	100	2524	2^+		
5662		2769	100	2892.68	4^+		
5675		1994	100	3681	3^-		
5766		2558	100	3208	2^+		
5818		2925	100	2892.68	4^+		
5885		2992	53 *4*	2892.68	4^+		
		4424	47 *4*	1460.849	2^+		
5912		1830	50 *5*	4082	$2^-,3^-$		
		2704	50 *5*	3208	2^+		
5931		3038	72 *4*	2892.68	4^+		
		4470	28 *4*	1460.849	2^+		
5973	(6^-)	2508	100	3464.59	6^+		
6013	(7^-)	1519	50 *3*	4494	5^-		
		2548	50 *3*	3464.59	6^+		
6099		4638	75 *5*	1460.849	2^+		
		6099	25 *5*	0	0^+		
6104		3211	100	2892.68	4^+		
6138		2673	100	3464.59	6^+		
6158		2693	87 *2*	3464.59	6^+		
		3265	13 *2*	2892.68	4^+		
6185		1691	100	4494	5^-		
6203		3310	100	2892.68	4^+		
6270		2805	100	3464.59	6^+		
6305		2790	60 *5*	3515	4^+		
		2840	40 *5*	3464.59	6^+		
6356		1498	67 *5*	4858	5^-		
		2891	33 *5*	3464.59	6^+		

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^{37}Cl(α,pγ) 1983Bi08 (continued)

$\gamma(^{40}Ar)$ (continued)

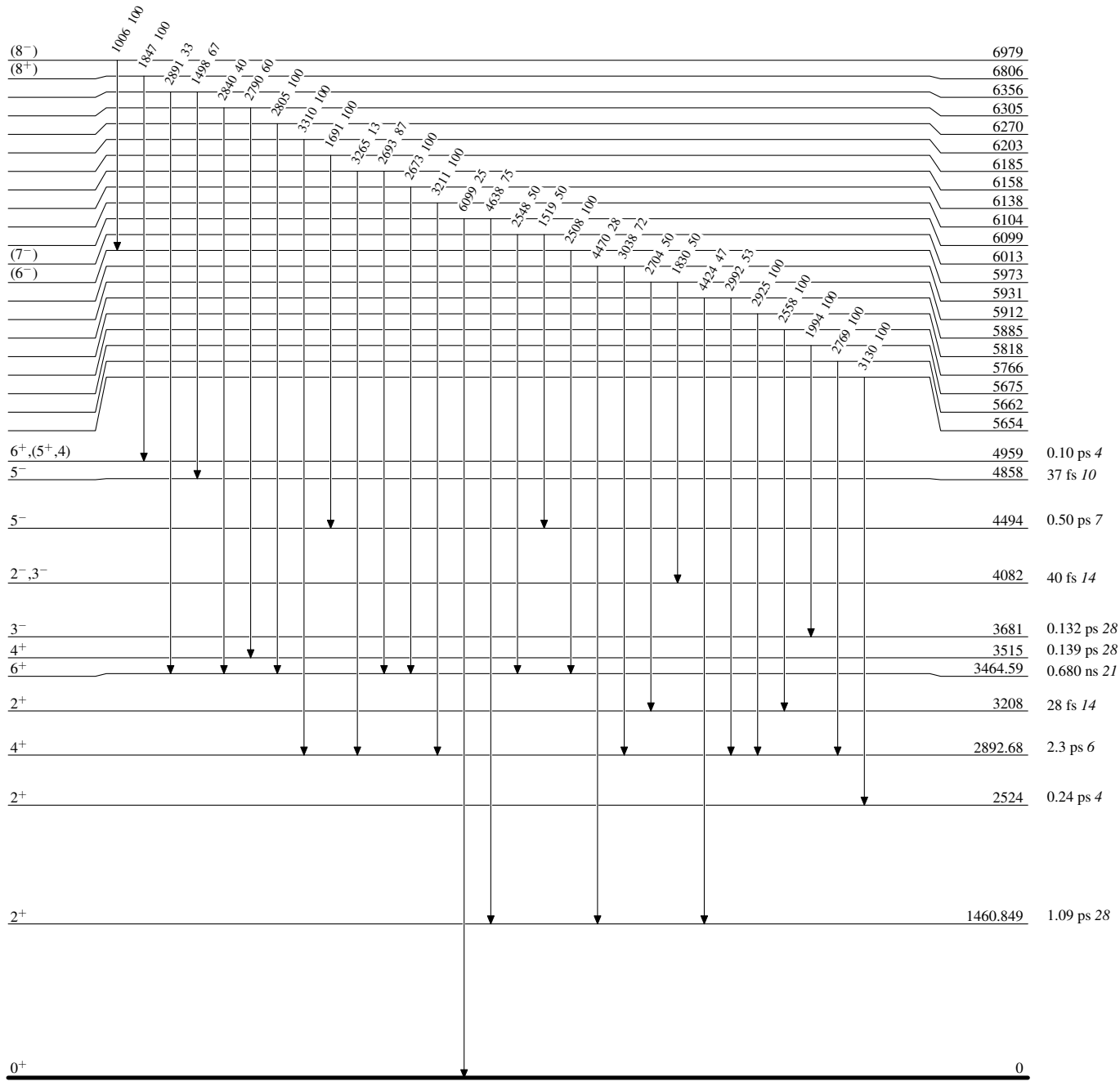
E_i(level)	J_i^π	E_γ †	I_γ #	E_f	J_f^π
6806	(8^+)	1847	100	4959	6^+,$(5^+,4)$
6979	(8^-)	1006	100	5973	(6^-)

† Values are not given in 1983Bi08 and taken by the evaluator from level-energy differences, unless otherwise noted.
‡ Original values from 1975Wa23 are relative to Eγ(1461γ)=1460.81 *4* for 1431γ and Eγ(^{207}Bi 570γ)=569.67 *2* for 571γ. Quoted values are deduced by the evaluator based on the Adopted Eγ(1461γ)=1460.820 *5* and Eγ(^{207}Bi 570γ)=569.698 *2*.
# Quoted values are % branchings from each level.
@ From 1983Bi08 based on $\gamma(\theta)$, γ(lin pol) and RUL where applicable.
& Placement of transition in the level scheme is uncertain.

^{37}Cl(α,pγ) 1983Bi08

Level Scheme

Intensities: % photon branching from each level



$^{40}_{18}Ar_{22}$

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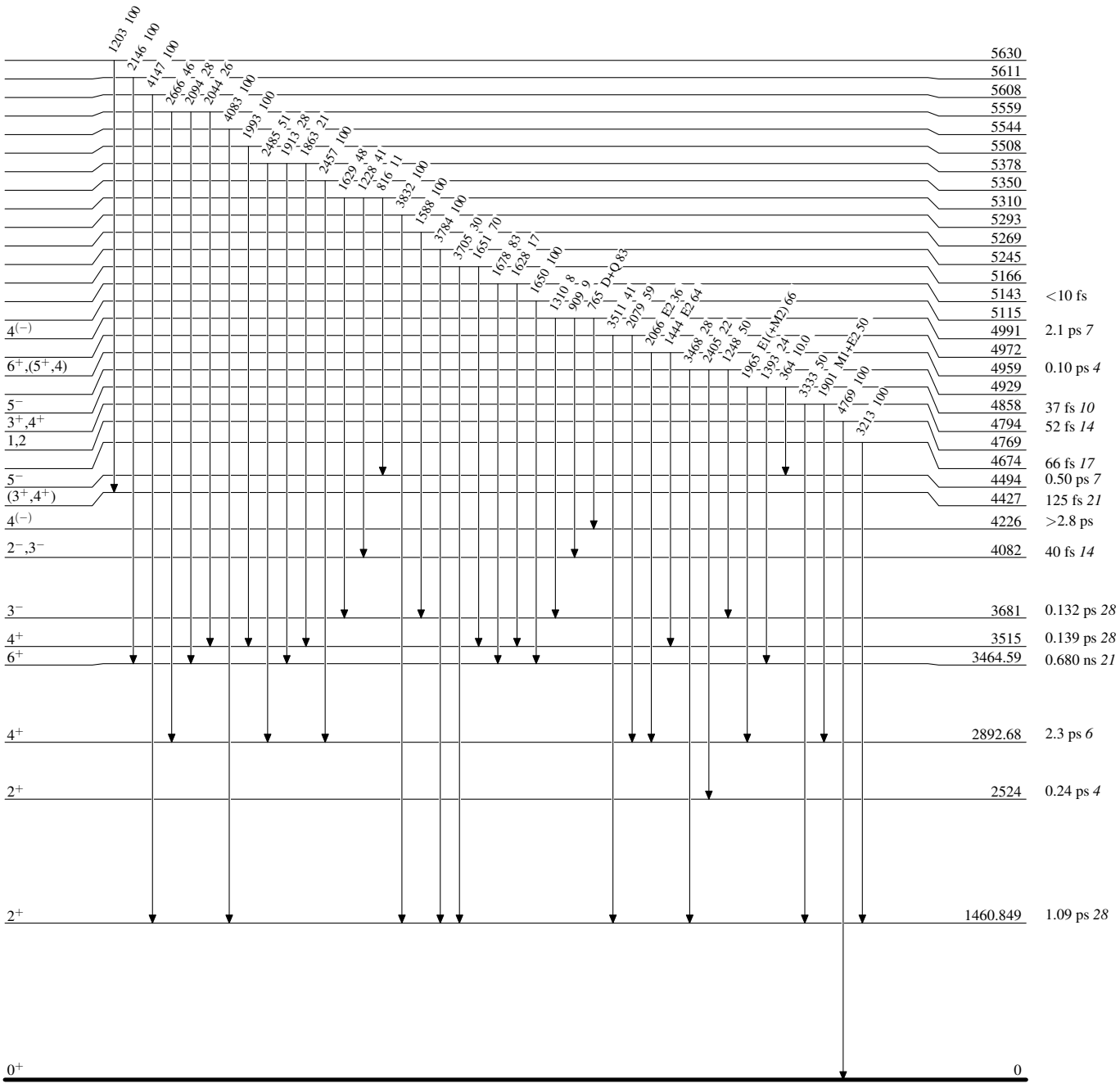
Level Scheme (continued)

Intensities: % photon branching from each level



$^{40}_{18}Ar_{22}$

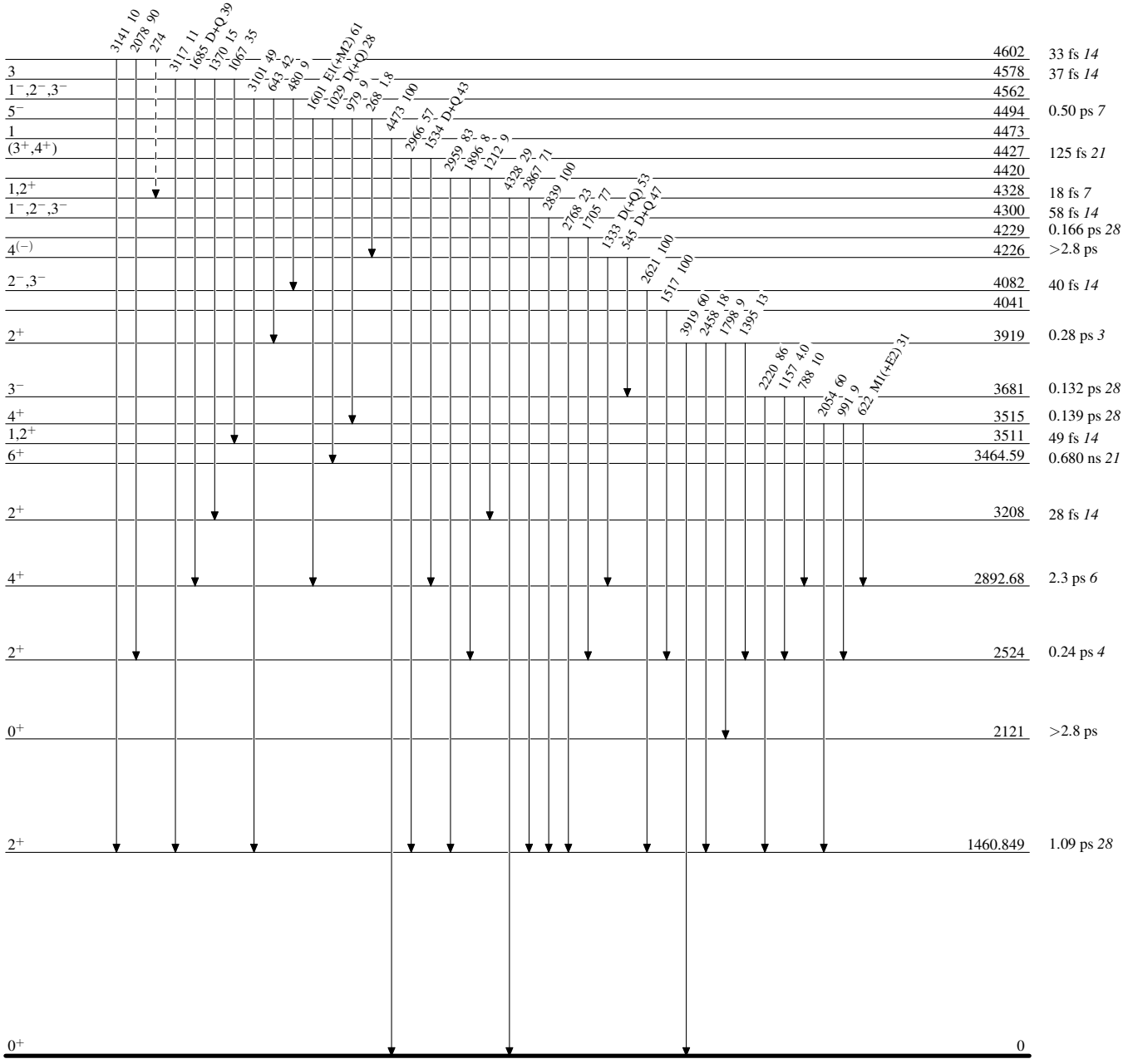
^{37}Cl(α,pγ) 1983Bi08

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

– – – – – – ► γ Decay (Uncertain)

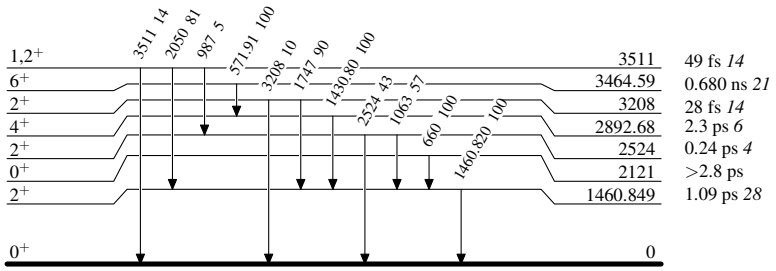


$^{40}_{18}Ar_{22}$

^{37}Cl(α,pγ) **1983Bi08**

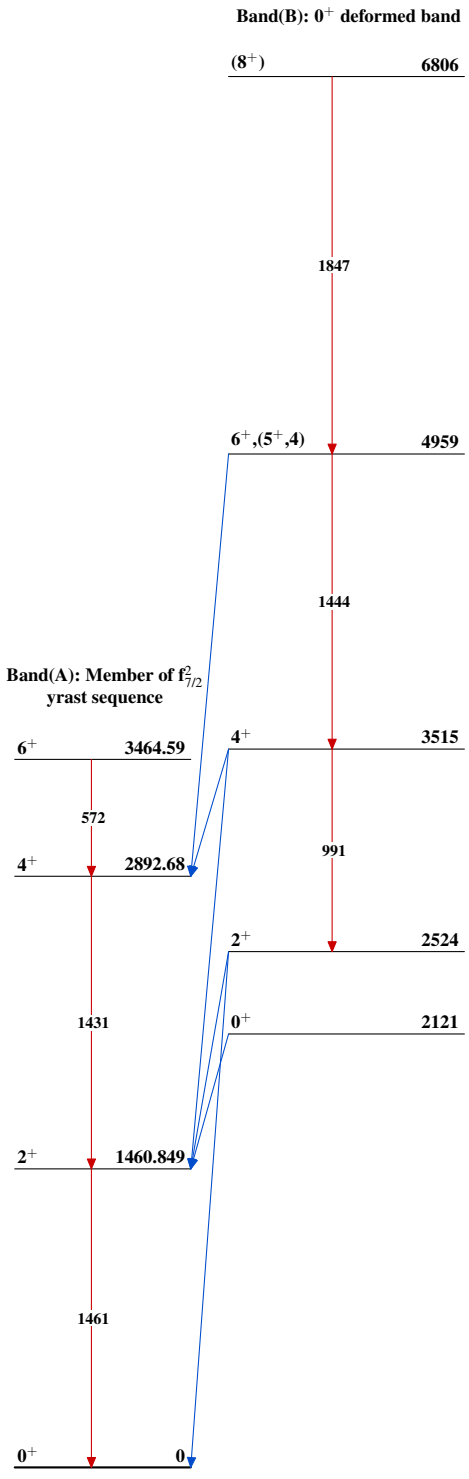
Level Scheme (continued)

Intensities: % photon branching from each level



$^{40}_{18}Ar_{22}$

^{37}Cl(α,pγ) 1983Bi08



$^{40}_{18}Ar_{22}$