Adopted Levels, Gammas

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

Q(β^-)=7480 *30*; S(n)=5830 *30*; S(p)=11680 *60*; Q(α)=−9730 *30* 2012Wa38
S(2n)=13900 *30*, S(2p)=27470 *90* (2012Wa38).
First identification of ^{40}Cl nuclide by 1956Mo39 via ^{40}Ar(n,p).
^{40}Cl produced in ^{40}Ar(n,p): 1956Mo39, 1965Gr03, 1970Ke12. Others: Thesis (Masters) by E.L. Robinson (Purdue University,1958), 1968Hu07, 1968Hu15, 1970Lu10, 1972Kl06, 1973Kl02.
A 0.10 s *3* activity in ^{40}Cl reported by 1968Fl10 (also 1968Fl11) is not convincing and has not been confirmed in any other study.
Mass measurements: 1989Mi03, 1984Fi02.
Other reactions:
2012Bh09: ^{40}Ar(n,p) E=9-15 MeV. Measured Eγ, Iγ, σ(E), activation method.
2012Zh06: ^{9}Be(^{40}Ar,X) and ^{181}Ta(^{40}Ar,X) E=57 MeV/nucleon. Measured fragment yields.
2008Kl02: 40Ar(μ^-,ν). Measured isotopic yields.
2007Na31: ^{136}Xe(p,X) E=1 GeV. Measured isotopic σ.
2006Ro34: ^{2}H(^{48}Ca,X) E=102 MeV/nucleon. Measured production σ.
1999Ai02: Si(^{40}Cl,X) E=38-80 MeV. Measured mean-energy integrated cross section, deduced strong absorption radii, r_0^2=1.28 fm^2 7, 1.21 fm^2 8.
1997Fo01: ^{208}Pb(^{37}Cl,X) E=230 MeV: measured yield.
1988Ma53: ^{40}Ar(n,p): analyzed one-nucleon transfer σ data, deduced g.s. occupation numbers for ^{40}Ar.
Additional information 1.
1971Ar32: ^{232}Th(^{40}Ar,X): yield for ^{40}Cl production.

^{40}Cl Levels

Cross Reference (XREF) Flags

A ^{40}S β^- decay (8.8 s)
B ^{9}Be(^{36}S,αpγ)
C ^{40}Ar(^{7}Li,^{7}Be),(^{11}B,^{11}C)
D ^{208}Pb(^{40}Ar,Xγ)

E(level)†	J$^\pi$#	T$_{1/2}$‡	XREF	Comments
0@	2$^-$	1.35 min *3*	ABCD	%β^-=100 J$^\pi$: log *ft*=4.9 for β^- decay to 1$^-$ level at E=5880 in ^{40}Ar, log *ft*=5.9 to 3$^-$ level at E=4083 in ^{40}Ar. T$_{1/2}$: weighted average of 1.32 min *2* (1972Kl06), 1.44 min *8* (1970Ke12), 1.38 min *2* (thesis (masters) by E.L. Robinson, Purdue University,1958). Other: 1.4 min (1956Mo39).
211.62 *13*	(1$^-$)		ABcD	
244.03@ *8*	(3$^-$)	<10 ns	BcD	
367.1 *4*	(2)		B D	
431.8 *3*	(1 to 3$^+$)		AB D	J$^\pi$: 431.58γ (D) to 2$^-$; 457.8γ and 1875.6γ from 1$^+$.
601.28@ *14*	(4$^-$)	<7 ns	BcD	
680.95 *17*	(4$^-$)		BcD	
839.16@ *15*	(5$^-$)		BCD	
889.5 *4*	1$^+$		A D	J$^\pi$: log *ft*=4.7 from 0$^+$ in ^{40}S.
1160 *40*	(4$^-$)		CD	J$^\pi$: tentatively assigned by 1984Fi02 in ^{40}Ar(^{7}Li,^{7}Be).
1293.3 *5*	(0$^-$,1,2)		A	J$^\pi$: 1292.87γ to 2$^-$, 403.70γ to 1$^+$ and 1081.33γ to (1$^-$).
1580 *40*			C	
1740 *40*			C	
2014.7@ *4*	(6$^-$)	≤3.5 ps	BCD	

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Adopted Levels, Gammas (continued)

^{40}Cl Levels (continued)

E(level)[†]	J$^\pi$[#]	$T_{1/2}$[‡]	XREF	Comments
2194.2 *3*	(5)		B	
2307.2 *7*	1^+		A C	XREF: C(2290). J$^\pi$: log *ft*=3.7 from 0^+ in ^{40}S.
2413.7 *4*	(6)		B	
2620.4[@] *5*	(7^-)	≤3.5 ps	B	
4087.1?[@] *8*	(8^-)		B	

[†] From a least-squares fit to γ-ray energies.
[‡] From (^{36}S,αpγ) for excited states.
[#] When no J^π arguments are given, the assignments are based on $\gamma(\theta)$ data in (^{36}S,αpγ) and comparison of experimental level structure with shell-model calculations (particularly of 1989Wa09 and 1989Ji01).
[@] Band(A): Yrast negative-parity structure. A multiplet (2^- to 5^-) is expected from weak coupling of $3/2^+$ g.s. of ^{37}Cl and $7/2^-$ g.s. of ^{43}Ca.

$\gamma(^{40}Cl)$

E$_i$(level)	J$_i^\pi$	E$_\gamma$	I$_\gamma$[†]	E$_f$	J$_f^\pi$	Mult.[#]	Comments
211.62	(1^-)	211.59 *11*	100	0	2^-	(D)	E$_\gamma$: weighted average of 211.59 *11* from ^{40}S β^- decay, 211.60 *13* from (^{36}S,αpγ), and 211.6 *4* from (^{40}Ar,Xγ).
244.03	(3^-)	244.02 *8*	100	0	2^-	(D)	E$_\gamma$: weighted average of 244.04 *8* from ^{9}Be(^{36}S,αpγ) and 244.0 *1* from ^{208}Pb(^{40}Ar,Xγ).
367.1	(2)	155.5 *3*	100	211.62	(1^-)		E$_\gamma$: weighted average of 155.5 *3* from ^{9}Be(^{36}S,αpγ) and 156 *1* from ^{208}Pb(^{40}Ar,Xγ).
431.8	(1 to 3^+)	431.58 *7*	100	0	2^-	(D)	E$_\gamma$: weighted average of 431.57 *7* from ^{40}S β^- decay, 431.63 *21* from ^{9}Be(^{36}S,αpγ), and 431.8 *4* from ^{208}Pb(^{40}Ar,Xγ).
601.28	(4^-)	357.37 *14*	100 *5*	244.03	(3^-)	(D)	E$_\gamma$: weighted average of 357.36 *14* from ^{9}Be(^{36}S,αpγ) and 357.4 *2* from ^{208}Pb(^{40}Ar,Xγ).
		601.1 *1*	9.1 *12*	0	2^-		E$_\gamma$: weighted average of 601.1 *3* from ^{9}Be(^{36}S,αpγ) and 601.1 *1* from ^{208}Pb(^{40}Ar,Xγ). I$_\gamma$: weighted average of 8.6 *14* from ^{9}Be(^{36}S,αpγ) and 10 *2* from ^{208}Pb(^{40}Ar,Xγ).
680.95	(4^-)	436.90 *10*	100	244.03	(3^-)	(D)	E$_\gamma$: weighted average of 436.86 *17* from ^{9}Be(^{36}S,αpγ) and 436.9 *1* from ^{208}Pb(^{40}Ar,Xγ).
839.16	(5^-)	157.8 *3*	9.7 *7*	680.95	(4^-)	(D)	E$_\gamma$: from ^{9}Be(^{36}S,αpγ) only.
		237.92 *9*	100 *3*	601.28	(4^-)	(D)	E$_\gamma$: weighted average of 237.93 *9* from ^{9}Be(^{36}S,αpγ) and 237.9 *1* from ^{208}Pb(^{40}Ar,Xγ).
		594.9 *4*	7.4 *16*	244.03	(3^-)		E$_\gamma$: from ^{9}Be(^{36}S,αpγ) only.
889.5	1^+	457.4[‡] *6*	15[‡] *4*	431.8	(1 to 3^+)		
		677.41[‡] *12*	100[‡] *14*	211.62	(1^-)		
		889.06 *17*	40[‡] *6*	0	2^-		E$_\gamma$: weighted average of 889.04 *17* from ^{40}S β^- decay and 889.2 *5* from ^{208}Pb(^{40}Ar,Xγ).

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Adopted Levels, Gammas (continued)

γ(^{40}Cl) (continued)

E_i(level)	J_i^π	E_γ	I_γ[†]	E_f	J_f^π	Mult.[#]	Comments
1160	(4$^-$)	563.3 *4*	100	601.28	(4$^-$)		E_γ: from ^{208}Pb(^{40}Ar,Xγ) only.
1293.3	(0$^-$,1,2)	403.70[‡] *12*	33[‡] *4*	889.5	1$^+$		
		1081.33[‡] *18*	100[‡] *13*	211.62	(1$^-$)		
		1292.87[‡] *21*	43[‡] *6*	0	2$^-$		
2014.7	(6$^-$)	1175.4 *3*	100	839.16	(5$^-$)		
2194.2	(5)	1513.6 *4*	100 *33*	680.95	(4$^-$)	(D)	
		1592.5 *4*	42 *8*	601.28	(4$^-$)		
2307.2	1$^+$	1013.57[‡] *13*	100[‡] *6*	1293.3	(0$^-$,1,2)		
		1874.41[‡] *19*	89[‡] *11*	431.8	(1 to 3$^+$)		
2413.7	(6)	219.52 *13*	100	2194.2	(5)	(D)	
2620.4	(7$^-$)	605.4 *6*	100 *30*	2014.7	(6$^-$)		I_γ: Iγ(605.4γ)/Iγ(1781.4γ)=60 *16*/100 *40* in (^{40}Ar,Xγ).
		1781.4 *5*	42 *15*	839.16	(5$^-$)		
4087.1?	(8$^-$)	1466.7[@] *6*	100	2620.4	(7$^-$)		

[†] From (^{36}S,αpγ), unless otherwise noted.
[‡] From ^{40}S β$^-$ decay.
[#] From (^{36}S,αpγ) based on measured γ(θ) consistent with ΔJ=1, dipole (1993Ba62).
[@] Placement of transition in the level scheme is uncertain.

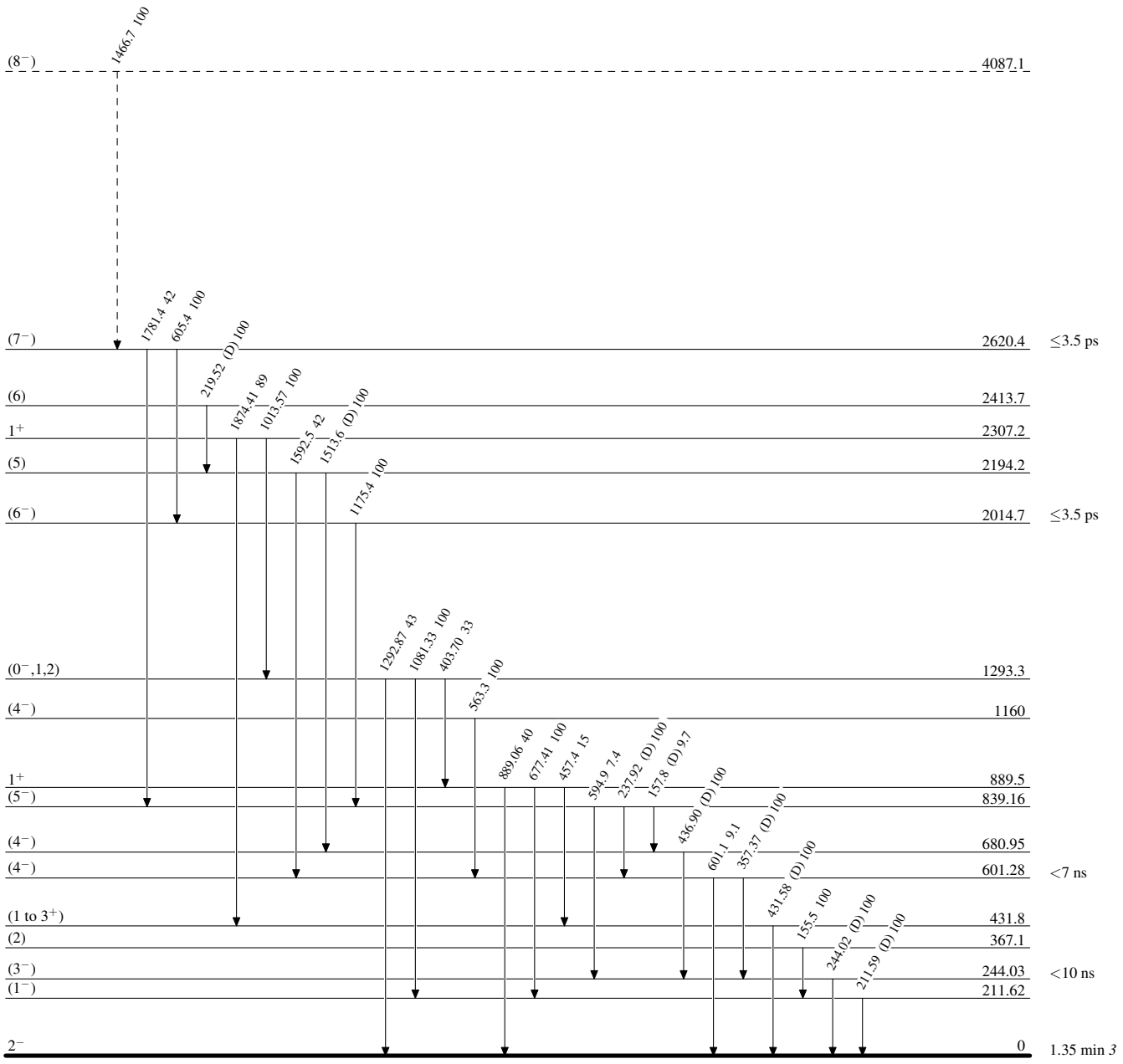
Adopted Levels, Gammas

Legend

Level Scheme

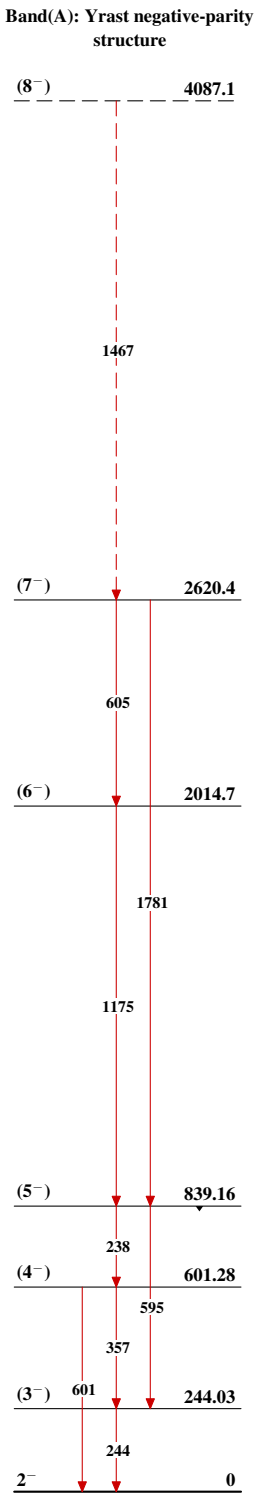
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{40}_{17}Cl_{23}$

Adopted Levels, Gammas



$^{40}_{17}Cl_{23}$