Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen[#] and Balraj Singh	NDS 135, 1 (2016)	31-May-2016

Q(β^-)=599 *6*; S(n)=9426 *6*; S(p)=14400 *70*; Q(α)=−9986 *9* 2012Wa38
S(2n)=15525 *6*, S(2p)=26163 *7* (2012Wa38).
^{42}Ar identified and produced by 1952Ka44 in successive thermal neutron capture in ^{40}Ar, estimated half-life from its decay to ^{42}K.
Mass measurements: mass excess=−34422.7 *58* (2001He29).

^{42}Ar Levels

Cross Reference (XREF) Flags

A	^{42}Cl β^- decay (6.8 s)	D	^{42}Ar(p,p′)
B	^{40}Ar(t,p)	E	^{208}Pb(^{40}Ar,Xγ)
C	^{40}Ar(t,pγ)	F	Pb(^{43}Ar,nγ)

E(level)[†]	J$^\pi$[#]	T$_{1/2}$[@]	XREF	Comments
0.0[&]	0$^+$	32.9 y *11*	ABCDEF	%β^-=100 J$^\pi$: L(t,p)=0. The rms charge radius (<r^2>)$^{1/2}$=3.4354 fm *39* (2013An02 evaluation. d<r^2>(^{38}Ar,^{42}Ar)=+0.2623 fm^2 *12*(stat) *62*(syst) (2008Bl01, also 2005Bl33, laser spectroscopy). T$_{1/2}$: from 1965St09 (β-counting). Others: 1964Ho31, 1952Ka44.
1208.22[&] *13*	2$^+$	2.6 ps *+7−6*	ABCDEF	β_2=0.32 *5* (2001Sc01) J$^\pi$: L(t,p)=2. In a review article by 2008BeZH, Fig. 4 seems to give g factor for the first 2$^+$ states in ^{38,40,42}Ar, but from Fig. 3 in 2006Sp01 (reference 18 in 2008BeZH), the isotopes should be ^{36,38,40}Ar, instead. It would seem that the x-axis in 2008BeZH is erroneously marked in neutron number.
2413.8[&] *6*	(4$^+$)		ABC EF	J$^\pi$: L(t,p)=3,4; γ from (6$^+$) supports 4$^+$. Measured upper limit of branching is <10 for transition to g.s.
2485.9 *3*	2$^+$	0.28 ps *11*	A C E	J$^\pi$: E2 γ to 0$^+$.
2512.5 *4*	(0$^+$ to 4$^+$)	2.8 ps *+21−8*	ABC	J$^\pi$: γ to 2$^+$ and RUL. Measured upper limit of branching is <10 for transition to g.s.
3013.7 *3*	(1,2$^+$)	<83 fs	A C	J$^\pi$: γ to 0$^+$.
3096.1 *5*	4$^+$	>3.5 ps	ABC E	J$^\pi$: ΔJ=2, E2(+M3) γ to 2$^+$; L(t,p)=3,4. Measured upper limit of branching is <5 for transition to g.s. (1973Pr10).
3557.9 *4*	2$^+$	<62 fs	ABC	J$^\pi$: γ to 0$^+$, ΔJ=0, dipole γ to 2$^+$.
3564.3[&] *6*	(6$^+$)		E	J$^\pi$: proposed by 2011Sz02 as the members of the 2$^+$, 4$^+$ and 6$^+$ yrast sequence and from comparison with shell model calculations as well.
3705 *10*	(2$^+$)		B	J$^\pi$: L(t,p)=(2).
3820 *20*			AB	XREF: A(3846). E(level): possible γ to g.s. and 1208 level from a 3846 level in ^{42}Cl β^-.
4005.3 *4*	2$^+$	0.23 ps *6*	BC	J$^\pi$,E(level): L=2 for 4012 level in (t,p) which is considered as associated with 4005.3 level in (t,pγ). It is possible part of this level may also correspond to 4013.6 level populated in β^- decay.
4013.6 *8*			A	See comment for 4005.3 level for possible population in (t,p).
4045.8 *4*			A	
4127.5 *5*	(0$^+$,1,2)	0.97 ps *21*	ABC	J$^\pi$: $\gamma(\theta)$ of γ to 2$^+$. Measured upper limit of branching is <5% for transition to g.s.
4287.1 *5*	(1,2,3)	<35 fs	BC	J$^\pi$: γ to 2$^+$; $\gamma(\theta)$.
4405 *5*	3$^-$,4$^+$		B	J$^\pi$: L(t,p)=3,4.
4417.3 *3*			A	

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Adopted Levels, Gammas (continued)

^{42}Ar Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
4633.9 *6*	(3^-)	<35 fs	ABC	Jπ: L(t,p)=(3,4); ΔJ=1 γ to 2^+.
4887 *10*	(3^-,4^+)		B	Jπ: L(t,p)=(3,4).
4896 *10*	(3^-,4^+)		AB	Jπ: L(t,p)=(3,4). E(level): possible 4902γ to g.s. from a tentative 4902 level in ^{42}Cl β^- may correspond to this level, but γ to 0^+ is inconsistent with J^π=(3^-,4^+).
5000 *15*			AB	E(level): possible γ to g.s. from a 5015 level in ^{42}Cl β^-.
5230 *15*			B	
5292 *15*			AB	E(level): possible 1284γ to 4013 level from a 5297 level in ^{42}Cl β^-.
5553 *15*	2^+		B	Jπ: L(t,p)=2.
5763 *15*			B	
5945 *20*			B	
6090 *20*			B	
6170 *15*			B	
6357 *15*			B	
6490 *20*			B	
6614 *20*			B	
6742 *15*			B	
6880 *30*			B	
7060 *20*			B	
7140 *20*			B	
7275 *15*			B	
7355 *15*			B	
7540 *30*			B	
7630[‡] *30*			AB	
7793 *15*			B	
7987 *15*			B	
8080 *30*			B	
8230 *30*			B	
8380 *20*			B	
8520 *20*			B	
8690 *20*			B	
8790 *20*			B	
8940 *30*			B	
9020 *30*			B	
9130 *30*			B	
9210 *20*			B	
9320 *30*			B	
9410 *30*			B	
9535 *25*			B	
9640 *30*			B	
9820 *20*			B	
9905 *20*			B	
10015 *20*			B	
10060 *30*			B	
10140 *30*			B	
10300 *30*			B	
10540 *30*			B	
10590 *30*			B	
10670 *30*			B	
10850 *30*			B	

[†] From adopted Eγ data when measured γ-ray energies are available. In other cases weighted averages are taken of values available from different reactions.

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Adopted Levels, Gammas (continued)

^{42}Ar Levels (continued)

‡ Possible γ to g.s. from a 7648 level in ^{42}Cl β^-.
# In (t,p) transfer reaction, target ^{40}Ar $J^\pi=0^+$.
@ From DSAM in (t,pγ), unless otherwise noted.
& Band(A): Yrast sequence (2011Sz02).

γ(^{42}Ar)

E_i(level)	J_i^π	E_γ†	I_γ‡	E_f	J_f^π	Mult.@	δ@	Comments
1208.22	2^+	1208.17 *13*	100	0.0	0^+	E2		B(E2)(W.u.)=9.8 *+29−21*
2413.8	(4^+)	1205.6 *5*	100	1208.22	2^+			
2485.9	2^+	1277.7 *3*	100# *4*	1208.22	2^+			
		2486.1 *8*	15.5# *25*	0.0	0^+	E2		B(E2)(W.u.)=0.33 *14*
2512.5	$(0^+$ to $4^+)$	1304.3 *3*	100	1208.22	2^+			
3013.7	$(1,2^+)$	1806.2 *4*	100 *7*	1208.22	2^+			
		3014.6 *8*	61 *7*	0.0	0^+			
3096.1	4^+	1887.8 *4*	100	1208.22	2^+	E2(+M3)	+0.07 *8*	B(E2)(W.u.)<0.76
3557.9	2^+	2349.6 *3*	100 *2*	1208.22	2^+	D(+Q)	0.00 *7*	
		3557.7	11 *2*	0.0	0^+	[E2]		B(E2)(W.u.)>0.18
3564.3	(6^+)	1150.4 *3*		2413.8	(4^+)			
4005.3	2^+	991.6		3013.7	$(1,2^+)$			
		1519.40 *22*		2485.9	2^+			
		2797.0		1208.22	2^+			
4013.6		1527.7		2485.9	2^+			
		1598.5& *8*	25 *4*	2413.8	(4^+)			
		2805.3 *7*	100 *8*	1208.22	2^+			
		4013.4		0.0	0^+			
4045.8		1560.1 *5*	32.6 *21*	2485.9	2^+			
		2837.3 *5*	100 *4*	1208.22	2^+			
		4045.6		0.0	0^+			
4127.5	$(0^+,1,2)$	1641.6		2485.9	2^+			
		2919.2 *4*	100	1208.22	2^+			
4287.1	(1,2,3)	3078.8 *4*		1208.22	2^+			
4417.3		403.9& *6*	8.4 *19*	4013.6				
		1404.7 *4*	15 *3*	3013.7	$(1,2^+)$			
		1931.7 *6*	41 *4*	2485.9	2^+			
		2003.4& *3*	21 *4*	2413.8	(4^+)			
		3208.3 *3*	100 *4*	1208.22	2^+			
4633.9	(3^-)	3425.5 *5*	100	1208.22	2^+	D		

† Values with uncertainties from (t,pγ), β^- decay or (^{40}Ar,Xγ). Weighted averages are taken when available. Others are from level energy differences.
‡ From (t,pγ), when a level is populated in β^- decay and in (t,pγ) and others from β^- decay, unless otherwise noted.
# From β^- decay.
@ From (t,pγ).
& Placement of transition in the level scheme is uncertain.

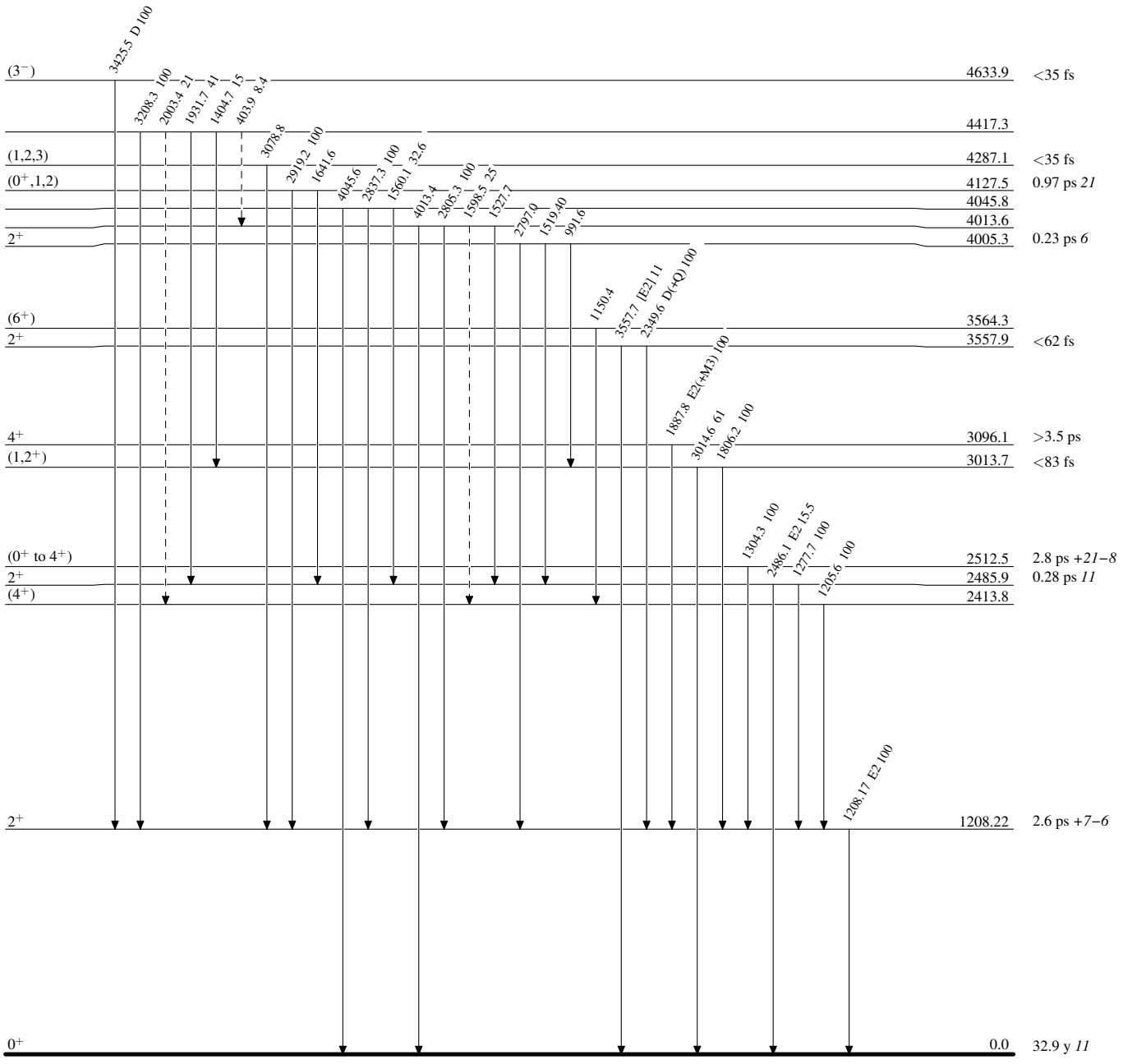
Adopted Levels, Gammas

Legend

Level Scheme

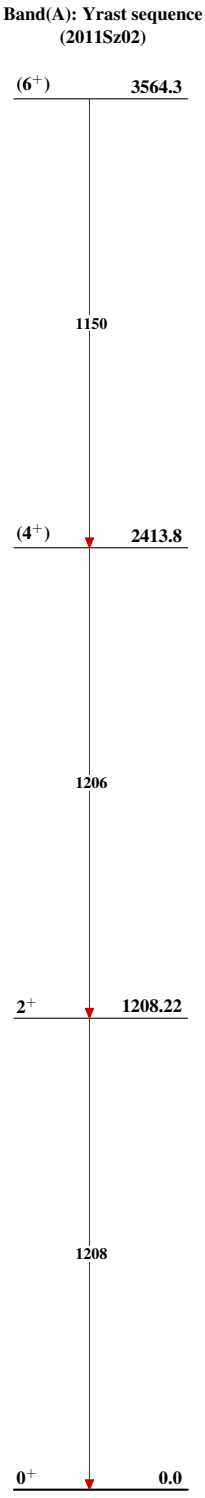
Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{42}_{18}Ar_{24}$

Adopted Levels, Gammas



$^{42}_{18}Ar_{24}$