Adopted Levels, Gammas

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

Q(β^-)=−1504.40 *6*; S(n)=9869 *5*; S(p)=12528.7 *17*; Q(α)=−6800.69 *19* 2012Wa38
S(2n)=16467.71 *19*, S(2p)=22757 *7* (2012Wa38).
First identification of ^{40}Ar nuclide by 1919As01 (later in 1921As01) in a mass spectrometer (2012Th10).
Other reactions:
2012Zh06: ^{9}Be(^{40}Ar,X), 181Ta(^{40}Ar,X) E=57 MeV/nucleon. Measured fragment yields.
2006LiZX: ^{9}Be(^{38}S,X) E=5.45 MeV/nucleon. Measured Eγ, Iγ.
1999Ma14: ^{40}Ar(μ-,X) E=125 MeV. Measured capture rates.
1996Ri19,1996Ri09: ^{40}Ar(^{16}O,^{16}O′) E=250 MeV/nucleon. Deduced structure near isovector dipole and isoscalar quadrupole giant resonances.
1994An39: ^{36}S(α,α). Resonances were observed at Eα=13320 (J^π=7$^-$) and Eα=14120 (J^π=8$^+$).
1992Wa11,1991Mo05: ^{40}Ca(π-,π+) E=295 MeV. Deduced double isovector giant−dipole resonance at 31.1 MeV with a width of 90 MeV.
1990Va11: ^{40}Ar(X,X) E=5.9 keV. Measured E(x-ray).
1989Al15: ^{40}Ar(^{32}S,^{32}S) E=100 MeV. Measured $\sigma(\theta)$. 1989Gr06: E=180, 240 MeV; 1979Da16: E=290 MeV.
1986Ge01,1985Ge04: ^{40}Ar(π,π) E=180 MeV. Measured $\sigma(\theta)$.
1985Sh06: ^{40}Ar(^{16}O,^{16}O) E=100 MeV. Measured $\sigma(\theta)$.
1983To18: ^{40}Ca(E,π+) E=400 MeV.
1980KoZI: ^{48}Ca(^{3}He,^{11}Be). Deduced 8-particle transfer and isospin=4 isotopic multiplet.
Muonic x ray: 2p$_{3/2}$ to 1s$_{1/2}$: 643.674 keV *20* (1981Fr25, 1992Fr01), 643.94 keV *11* (1971Bb11,1976Pf01).
Hyperfine structure and isotope shift measurements: 2008BeZH, 2005Bl33, 2003Sa20, 1996Kl04, 1988Mo30, 1986Mu06, 1982Ei01.
Mass measurement: 2005Go36, 2003Fr08, 2002Bf02, 2001Wa50, 1998Ca53, 1997Br44, 1995Ya15, 1995Di08, 1968Sc01, 1968Fu11.

^{40}Ar Levels

Cross Reference (XREF) Flags

A	^{40}Cl β^- decay (1.35 min)	I	^{38}Ar(α,^{2}He)	Q	^{40}Ar(α,α'),(α,α)
B	^{40}K ε decay (1.248×10^9 y)	J	^{40}Ar(γ,γ'),(pol γ,γ')	R	Coulomb excitation
C	^{12}C(^{36}S,2$\alpha\gamma$)	K	^{40}Ar(e,e′),(e,e)	S	^{40}Ca(^{14}C,^{14}O)
D	^{26}Mg(^{16}O,2pγ),^{27}Al(^{18}O,p$\alpha\gamma$)	L	^{40}Ar(n,n′γ),(n,n)	T	^{41}K(d,^{3}He)
E	^{26}Mg(^{18}O,2p2nγ)	M	^{40}Ar(p,p′γ)	U	^{42}Ca(^{14}C,^{16}O)
F	^{36}S(α,γ):resonances	N	^{40}Ar(p,p′),(pol p,p′)	V	^{44}Ca(^{3}He,^{7}Be)
G	^{37}Cl(α,pγ)	O	^{40}Ar(pol d,d′),(d,d′)	W	^{44}Ca(α,2α)
H	^{38}Ar(t,p)	P	^{40}Ar(^{3}He,^{3}He′),(^{3}He,^{3}He)	X	^{208}Pb(^{40}Ar,Xγ)

E(level)[†]	J$^\pi$[#]	T$_{1/2}$[@]	XREF	Comments
0[c]	0$^+$	stable	ABCDEFGHIJKLMNOPQRSTUVWX	J$^\pi$: Optical spectroscopy measurements: 1937Ko03, 1953Me73; no hyperfine structure seen. Evaluated rms charge radius=3.4274 fm *26* (2013An02). Δ<r^2>(^{38}Ar−^{40}Ar)=0.169 fm^2 33 (1996Kl04), 0.17 fm^2 (1986Mu06). charge radius <r^2>$_{1/2}$=3.415 fm *5* (1976Pf01), 3.429 fm *6* (1971Bb11) from Muonic x-ray data; 3.393 fm *15*(stat) (1976Fi12), 3.41 fm *4*, (1971Sc09), 3.47 fm *5* (1971Gr27,1975GrYY), 3.48 fm *4* (1974We02) from ^{40}Ar(e,e′) data.
1460.849[c] *5*	2$^+$	1.15 ps *5*	ABCDEFGHIJKLMNOPQRSTUVWX	μ=−0.04 *6* (2008Sp04,2014StZZ) Q=+0.01 *4* (1970Na05,2013StZZ) J$^\pi$: L(α,α')=L(t,p)=L(pol d,d′)=L(pol p,p′)=L(d,^{3}He)=2.

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)†	Jπ#	$T_{1/2}$@	XREF	Comments
				$T_{1/2}$: weighted average of 1.09 ps *28* from ^{37}Cl(α,pγ), 1.11 ps *4* from ^{40}Ar(e,e′), 1.35 ps *10* from ^{40}Ar(p,p′γ) and 1.25 ps *14* from ^{12}C(^{36}S,2$\alpha\gamma$). μ: using transient-field technique (2008Sp04). Others: −2 *2* (1992Cu04), −0.03 *8* (2005St22). Q: from reorientation in Coulomb Excitation (1970Na05).
2120.91[f] *17*	0$^+$	104 ps *14*	A C EFGH LMNO Q UVWX	Jπ: L(α,α′)=L(p,p′)=0; 680$\gamma(\theta)$ is isotropic from (n,n′γ). $T_{1/2}$: from pγ(t) in (p,p′γ).
2524.09[f] *11*	2$^+$	0.23 ps *4*	A C EFGH KLMNO Q T V X	Jπ: L(α,α′)=L(pol d,d′)=L(pol p,p′)=2. $T_{1/2}$: weighted average of 0.24 ps *4* from (α,pγ), 0.194 ps *35* from (e,e′) and 0.34 ps *6* from (p,p′γ). Others: 0.50 ps *8* from ^{36}S(α,γ):resonances, 0.47 ps *7* from ^{12}C(^{36}S,2$\alpha\gamma$).
2892.65[c] *9*	4$^+$	1.95 ps *28*	A CDEFGHI LMNO Q V X	Jπ: L(α,α′)=L(pol d,d′)=L(pol p,p′)=4. $T_{1/2}$: weighted average of 2.9 ps *14* from ^{26}Mg(^{16}O,2pγ), 2.3 ps *6* from (α,pγ), 1.80 ps *28* from ^{12}C(^{36}S,2$\alpha\gamma$), and 3.0 ps *+18−9* from (p,p′γ).
3207.93 *13*	2$^+$	34 fs *7*	A C FGH KLMNO Q TUV X	Jπ: L(t,p)=L(pol p,p′)=2. $T_{1/2}$: weighted average of 28 fs *14* from (α,pγ) and 35 fs *7* from (e,e′). Others: 62 fs *12* from (α,γ):resonances, <24 fs from (p,p′γ).
3464.56[c] *12*	6$^+$	0.680 ns *21*	DE GHI Q X	Jπ: 571.88γ E2 to 4$^+$, L(t,p)=(6). $T_{1/2}$: from (α,pγ).
3511.54 *20*	2$^+$	59 fs *12*	A FGH K MNO q T V X	Jπ: L(pol d,d′)=L(d,^{3}He)=2. $T_{1/2}$: weighted average of 62 fs *12* from (α,γ):resonances, 49 fs *14* from (α,pγ) and 83 fs *31* from (p,p′γ).
3515[f] *1*	4$^+$	0.139 ps *28*	E G q	Jπ: from $\gamma(\theta)$ in (α,pγ) and γ(DCO) and band assignment in ^{26}Mg(^{18}O,2p2nγ).
3680.60 *12*	3$^-$	0.132 ps *28*	A C FGH K MNO Q V X	Jπ: L(α,α′)=L(pol d,d′)=L(pol p,p′)=3. $T_{1/2}$: from (α,pγ). Other: 0.10 ps *+6−5* from (p,p′γ).
3918.85 *12*	2$^+$	0.29 ps *3*	A FGH K MNo q	Jπ: 3918.6γ E2 to 0$^+$, L(t,p)=L(pol p,p′)=2. $T_{1/2}$: weighted average of 0.28 ps *3* from (α,pγ) and 0.30 ps *4* from (p,p′γ).
3941.9? *2*			A o q w	XREF: A(?). Jπ: (1,2$^+$) from possible 3941.7γ to 0$^+$ g.s.
4042 *2*	NATURAL		FGH MN Q w	XREF: N(4053). E(level): from (p,p′γ). Jπ: 0$^+$, 1$^-$, 2$^+$, 3$^-$, 4$^+$ from γ to 2$^+$ and π=natural in (α,α′).
4082.63 *16*	3$^-$	40 fs *14*	A FGH MN Q w	Jπ: based on $\gamma(\theta$,pol) in (α,pγ) and p$\gamma(\theta)$ in (p,p′γ), log *ft*=5.9 from 2$^-$ in ^{40}Cl β^- decay.
4178.9? *3*			A	XREF: A(?).
4230 *2*	4$^{(-)}$	>2.8 ps	C G m	Jπ: based on $\gamma(\theta$,pol) in (α,pγ).
4232 *2*	(1$^+$,2$^-$,3$^+$)	0.166 ps *28*	G mN Q	XREF: N(4240). Jπ: possible unnatural parity from (α,α′); 1705γ and 2768γ to 2$^+$.
4301.08 *23*	(3)$^-$	58 fs *14*	A FGh MN Q u	Jπ: log *ft*=5.1 from 2$^-$ in ^{40}Cl β^- decay;

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)†	Jπ#	$T_{1/2}$@	XREF	Comments
				possible natural parity in (α,α′); L(p,p′)=(2,3).
4324.5 *3*	2+	16 fs *6*	A FGh Q Tu	XREF: T(4360). Jπ: L(d,^{3}He)=0, L(t,p)=2. $T_{1/2}$: weighted average of 15 fs *6* from ^{36}S(α,γ):resonances and 18 fs *7* from (α,pγ).
4358.0 *3*			A N Q u	XREF: A(?)N(?). Jπ: π=(natural) from (α,α′), (1,2+) from possible 4357.6γ to 0+ g.s.
4420 *1*	(2+,3−)		G MNO q	XREF: N(4430). Jπ: 2959γ, 1896γ and 1212γ to 2+ gives (0+:4+); natural parity in (α,α′) for 4420 and/or 4427 levels gives 1−,2+,3−,4+; L(pol d,d′)=(2) gives (2+); L(pol p,p′)=3 gives 3−.
4427 *1*	(4+)	0.125 ps *21*	GH q	Jπ: L(t,p)=3,4; γ(θ,pol) in (α,pγ) gives 3+,4,5+; 4−,5+ is ruled out by RUL for 2966γ to 2+.
4473 *1*	1&	0.070 eV *13*	FG J N	XREF: N(4484). Jπ: from γ(θ) in (α,γ):resoances, (γ,γ′) and (α,pγ). $T_{1/2}$: from (2J+1)Γ_0^2/Γ=0.21 eV *4* with Γ_0/Γ=1 in (γ,γ′).
4481.0 *3*	1−	<0.07 ps	A M Q	XREF: A(?). Jπ: from γ(θ) in (p,p′γ); natural parity in (α,α′). $T_{1/2}$: from (p,p′γ).
4494[d] *1*	5−	0.50 ps *7*	C E GH	Jπ: 1601γ E1(+M2) to 4+, 1029γ d(+Q) to 6+. $T_{1/2}$: from (α,pγ).
4562.36 *16*	(1,3)−		A G Q T	XREF: T(4530). Jπ: log *ft*=5.4 from 2− in ^{40}Cl β− decay; possible natural parity in (α,α′).
4578 *1*	3(−)	37 fs *14*	A G N Q	XREF: A(?). Jπ: 2+,3 is given by 1983Bi08 in (α,pγ) based on γ(θ), but J^π=2+ should be ruled out since it results in ΔJ=2 for the 1685γ to 4+, which expects positive A_2 value while the measured A_2 by 1983Bi08 is negative. Natural parity in (α,α′) gives π=− for J=3.
4602 *1*		53 fs *20*	FG N Q	Jπ: 2078γ and 3141γ to 2+; possible natural parity in (α,α′). $T_{1/2}$: unweighted average of 73 fs *12* from (α,γ):resonances and 33 fs *14* from (α,pγ).
4674 *1*	(1+,2−,3+)	66 fs *17*	GH N Q u	XREF: N(4683). Jπ: 3213γ to 2+; possible π=unnatural in (α,α′).
4737.8? *4*			A Q u	XREF: A(?). Jπ: (1,2+) from possible 4737.5γ to 0+ g.s.
4769.0 *3*	1−	0.82 eV *6*	A G J N Q	Jπ: based on γ(θ,pol) in (pol γ,γ′) and γ(θ) in (α,pγ); possible π=natural in (α,α′). $T_{1/2}$: from (2J+1)Γ_0^2/Γ=2.46 eV *17* with Γ_0/Γ=1 in (γ,γ′).
4794 *1*	4+	52 fs *14*	GH N Q	XREF: N(4808). Jπ: 1901γ M1+E2 to 4+, L(t,p)=3,4.
4858 *1*	5−	37 fs *10*	G	Jπ: 1965γ E1(+M2) to 4+, 1394γ to 6+.
4870 *10*	3−		H NO Q	E(level): from (t,p). Jπ: L(pol d,d′)=3; L(t,p)=3,4.
4901? *3*			J	Jπ: (1,2+) from possible 4901γ to 0+ g.s.
4929 *1*	(1− to 4+)		G N	XREF: N(4941).

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
				Jπ: 2405γ and 3468γ to 2^+ and 1248γ to 3^-.
4942.6? *4*			A q	XREF: A(?).
4959[f] *1*	6^+	0.10 ps *4*	E Gh q	Jπ: 1444γ and 2066γ E2 to 4^+; γ(DCO) and band assignment in ^{26}Mg(^{18}O,2p2nγ).
4972 *1*	$(2^+,3,4^+)$		Gh	Jπ: 2079γ to 4^+ and 3511γ to 2^+.
4991 *1*	$4^{(-)}$	2.1 ps *7*	G N Q	XREF: N(5004). Jπ: based on γ(θ,pol) of 765γ in (α,pγ), which implies a parity conserving transition to $4^{(-)}$. But the parity is inconsistent with possible natural parity in (α,α′), which is π=+ for J=4.
5110? *3*			J	Jπ: $(1,2^+)$ from possible 5110γ to 0^+.
5115 *2*	(5^-)		GH	Jπ: L(t,p)=(5).
5143 *2*	(5)	<10 fs	G	Jπ: 1628γ to 4^+ and 1678γ to 6^+ gives $(4^+,5,6^+)$; $T_{1/2}$ disfavors E2 for either transition.
5165.6 *8*	$(2)^+$		A G Q t	Jπ: 1650γ to 4^+ and 3704.6γ to 2^+; natural parity in (α,α′) favors $(2,4)^+$; L(d,^{3}He)=0 from $3/2^+$ for a level at 5200 gives $1^+,2^+$; $(1,2^+)$ from possible 5165.5γ to 0^+.
5191 *15*			H t	E(level): from (t,p). Jπ: L(d,^{3}He)=0 from $3/2^+$ for a level at 5200 gives $1^+,2^+$.
5245 *2*	$(0^+$ to $4^+)$		G	Jπ: 3784γ to 2^+.
5269.6 *3*	$(1^-,3^-)$		A G n Q u	Jπ: 1186.7γ and 1589.0γ to 3^- and 2063.0γ to 2^+; possible natural parity in (α,α′); log *ft*=5.9 from 2^- in ^{40}Cl β^- decay.
5293 *2*	(2^+)		Gh n u	Jπ: 3832γ to 2^+; L=2 for a level at 5298 *15* in (t,p).
5310 *2*	(2^+)		A Gh n Q u	XREF: A(?). Jπ: possible natural parity from (α,α′); 1228γ and 1629γ to 3^-; L=2 for a level at 5298 *15* in (t,p).
5350 *2*			G u	Jπ: 2457γ to 4^+.
5378 *2*	$(4^+,5,6^+)$		G	Jπ: 1863γ and 2485γ to 4^+ and 1913γ to 6^+.
5400.5 *8*	1^-	0.030 eV *7*	A H J N Q	XREF: N(?). Jπ: spin from γ(θ) in (γ,γ′); natural parity in (α,α′). L(p,p′)=(5) for a level at 5410 is inconsistent and it might imply that it is a different level. $T_{1/2}$: from $(2J+1)\Gamma_0^2/\Gamma$=0.09 eV *2* in (γ,γ′) assuming Γ_0/Γ=1.
5454 *15*	$3^-,4^+$		H N Q	E(level): from (t,p). Jπ: L(t,p)=3,4.
5508 *2*	NATURAL		GH Q	Jπ: natural parity from (α,α′); 1993γ to 4^+.
5544 *2*	$(0^+$ to $4^+)$		G	Jπ: 4083γ to 2^+.
5559 *2*	$(4^+,5^-,6^+)$		G Q	Jπ: 2044γ and 2666γ to 4^+ and 2094γ to 6^+; natural parity in (α,α′).
5608.8 *10*	(1,2,3)		A G q	Jπ: 4147.8γ to 2^+; log *ft*=6.3 from 2^- in ^{40}Cl β^- decay; possible natural parity in (α,α′) for a group near 5608.
5611 *2*			G q	Jπ: 2147γ to 6^+.
5630 *1*			A G q	XREF: A(?). Jπ: 1203γ to (4^+); possible natural parity from (α,α′) for a doublet.
5654 *2*			G	Jπ: 3130γ to 2^+.
5662 *2*			G n	Jπ: 2769γ to 4^+.
5675 *2*	$(3^-,4^+)$		GH n Q	Jπ: L(t,p)=3,4; possible natural parity in (α,α′).
5717.8? *10*			A n Q w	

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)†	Jπ#	$T_{1/2}$@	XREF	Comments
5766 *2*			G w	Jπ: 2558γ to 2+.
5818 *2*	(3−,4+)		GH T w	XREF: H(5835). Jπ: L(t,p)=3,4.
5880.3 *4*	1−	0.117 eV *13*	A J o q	Jπ: log *ft*=4.9 from 2− in ^{40}Cl β− decay; spin=1 from γ(θ) in (γ,γ′). $T_{1/2}$: from (2J+1)Γ_0^2/Γ=0.35 eV *4* in (γ,γ′) assuming Γ_0/Γ=1.
5885 *2*	3−		GH No q	XREF: N(5900). Jπ: L(pol p,p′)=3; L(pol d,d′)=(3). But L(t,p)=2 for a level at 5883 *15* is inconsistent.
5906.0 *7*	(1−)		A q	Jπ: 3784.9γ to 0+; log *ft*=5.8 from 2− in ^{40}Cl β− decay; possible natural parity in (α,α′).
5912 *3*	1&	0.050 eV *17*	J q	E(level): a level at the same energy is also observed in (α,pγ) but with completely different decay mode and it is considered by evaluator as a separate level. $T_{1/2}$: from (2J+1)Γ_0^2/Γ=0.15 eV *5* in (γ,γ′) assuming Γ_0/Γ=1.
5912 *2*	(1− to 4+)		G q	Jπ: 1830γ to 3− and 2704γ to 2+.
5931 *2*	(2+,3,4+)		G	Jπ: 3038γ to 4+ and 4470γ to 2+.
5950.5 *10*	(1,2)		A	Jπ: 5950.0γ to 0+; log *ft*=6.9 from 2− in ^{40}Cl β− decay.
5973e *2*	(6−)		E G	Jπ: from (α,pγ) based on analog in ^{42}Ca, and from γ(DCO) in ^{26}Mg(^{18}O,2p2nγ).
6013d *2*	(7−)		E G	Jπ: from (α,pγ) based on analog in ^{42}Ca, and from γ(DCO) and band assignment in ^{26}Mg(^{18}O,2p2nγ).
6053.6 *8*	1(−)	0.41 eV *6*	A J q	Jπ: spin from γ(θ) in (γ,γ′); log *ft*=5.9 from 2− in ^{40}Cl β− decay. $T_{1/2}$: from (2J+1)Γ_0^2/Γ=1.24 eV *19* in (γ,γ′) assuming Γ_0/Γ=1.
6054	4+		O q	E(level): as quoted in 1976Se09 in (pol d,d′). A level at the same energy is also observed in ^{40}Cl β− decay and (γ,γ′) but with $J^\pi=1^{(-)}$. Therefore it is considered as a separate level. Jπ: L(pol d,d′)=4.
6100 *2*	(1,2+)		G J	Jπ: based on γγ(θ) in (γ,γ′) and 6100γ to 0+. Γ_0=0.22 eV *6* for J(6100)=1 and 0.13 eV *4* f0r J(6100)=2 from (2J+1)Γ_0^2/Γ=0.17 eV *5* in (γ,γ′) with Γ_0/Γ=0.26.
6104 *2*			G	Jπ: 3211γ to 4+.
6138 *2*			A GH N Q	XREF: A(?). Jπ: 2674γ to 6+, but L=(2,3) in (p,p′) and L(t,p)=(5) are inconsistent.
6158 *2*	(4+,5,6+)		G	Jπ: 2693γ to 6+ and 3265γ to 4+.
6185 *2*			G	Jπ: 1691γ to 5−.
6203 *2*			G q T	XREF: T(6230). Jπ: 3310γ to 4+; natural parity in (α,α′).
6208.5 *8*	(1,2)		A q	Jπ: 6208γ to 0+; log *ft*=6.6 from 2− in ^{40}Cl β− decay.
6270 *2*			G n	Jπ: 2806γ to 6+.
6276.0? *9*	1−,2−,3−		A n	XREF: A(?). Jπ: log *ft*=5.6 from 2− in ^{40}Cl β− decay.
6305 *2*	(4+,5,6+)		GH n	Jπ: 2790γ to 4+ and 2840γ to 6+.

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
6338.7 *11*	1^-	0.29 eV *3*	A J	Jπ: spin from γγ(θ) in (γ,γ′); log *ft*=5.6 from 2^- in ^{40}Cl β^- decay. $T_{1/2}$: from $(2J+1)\Gamma_0^2/\Gamma$=0.87 eV *10* in (γ,γ′) with Γ_0/Γ=1.
6356 *2*	$(4^+$ to $7^-)$		G	Jπ: 1498γ to 5^- and 2891γ to 6^+.
6421[‡]	(8^-)[b]		E	
6450? *3*			J	
6476.0 *8*	1^-	0.43 eV *5*	A H J N	Jπ: spin from γγ(θ) in (γ,γ′); log *ft*=5.6 from 2^- in ^{40}Cl β^- decay. L(t,p)=(2) is inconsistent. $T_{1/2}$: from $(2J+1)\Gamma_0^2/\Gamma$=1.29 eV *16* in (γ,γ′) with Γ_0/Γ=1.
6651.7 *8*			A H N	XREF: A(?)N(6650).
6703 *3*	1[&]		J	
6760 *15*	$3^-,4^+$		H	E(level): from (t,p). Jπ: L(t,p)=3,4.
6806[f]	(8^+)		E G	E(level): from (α,pγ). Other: 6801 from ^{26}Mg(^{18}O,2p2nγ). Jπ: from γ(DCO) and band assignment in ^{26}Mg(^{18}O,2p2nγ); possible analog state of ^{42}Ca (1983Bi08) from (α,pγ).
6835 *15*	$3^-,4^+$		H	E(level): from (t,p). Jπ: L(t,p)=3,4.
6979[e]	(8^-)		E G	Jπ: from γ(DCO) and band assignment in ^{26}Mg(^{18}O,2p2nγ); possible analog state of ^{42}Ca (1983Bi08) from (α,pγ).
7070 *15*			H	E(level): from (t,p).
7168 *3*	1[&]		H J	
7246 *3*	1[&]		J	
7281 *3*	1[&]		H J N	XREF: H(7300)N(7300).
7519 *3*	1[&]		H J	XREF: H(7495).
7626 *3*	1[&]		J	
7640 *15*	2^+		H	E(level): from (t,p). Jπ: L(t,p)=2.
7688[‡d]	(9^-)[b]		E	
7708 *3*	1^-[&]		J	
7730 *3*			H	E(level): from (t,p).
7918 *2*	1^-[&]		H J	XREF: H(7890).
7993 *3*	1^-[&]		E H J	XREF: H(7980).
7999[‡e]	(10^-)[b]		E	
8032 *3*	1^-[&]		J	
8163 *2*	1^-[&]		J	
8191 *3*	1^-[&]		J	
8303 *3*	1^-[&]		J	
8552 *3*	1^-[&]		J	
8585 *3*	1^-[&]		J	
8644 *3*	1^-[&]		J	
8676 *3*	$1,2^+$[&]		J	
8834 *4*	1^-[&]		J	

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
8884 *3*	1−[&]		J	
8918 *3*	1−[&]	0.34 eV *14*	F iJ	$T_{1/2}$: from (γ,γ′).
8946[‡d]	(11−)[b]		E	
9070[‡f]	(10+)[b]		E	
9127 *3*	1−[&]	0.71 eV *14*	F iJ	$T_{1/2}$: from (γ,γ′). 0.72 eV *16* from ^{36}S(α,γ):resonances.
9138 *6*	(1−,2+)[a]		F	
9147 *5*	1−[a]		F	
9178 *3*	1−[a]		F	
9197 *6*	(1−,2+)[a]		F	
9216 *4*	1−[a]		F	
9234 *4*	1−[a]		F	
9240 *6*	1−[a]		F	
9264 *4*	(1−,2+)[a]		F	
9273 *6*	1−[a]		F	
9287 *4*			F	
9296 *5*	(1−,2+)[a]		F	
9314 *4*	1−[&a]		F J	
9330 *4*	1−[a]		F	
9337 *3*	1−[a]		F J	
9355 *3*	1−[&a]	1.0 eV *3*	F J	$T_{1/2}$: from (γ,γ′). 1.1 eV *3* from (α,γ):resonances.
9373 *4*			F	
9416 *3*	1−[&a]	3.4 eV *18*	F J	E(level): doublet: 9408+9417 in (α,γ) with same J^π for both; the second component seems to correspond to 9416 in (γ,γ′). $T_{1/2}$: from (γ,γ′). 4.0 eV *20* from ^{36}S(α,γ):resonances.
9425 *5*	(1−,2+)[a]		F	
9433 *5*	(1−,2+)[a]		F	
9450 *3*	1−[a]		F	
9472 *4*	(1−,2+)[a]		F	
9485 *5*	1−[a]		F	
9491?			F	
9504.2 *14*	1−[&a]	7.9 eV *13*	F J	$T_{1/2}$: from (γ,γ′). 8.2 eV *18* from ^{36}S(α,γ):resonances.
9527 *4*			F	
9565 *4*	1−[a]		F	
9583 *3*	1−[&a]	7.3 eV *21*	F J	E(level): doublet:9581+9586 in (α,γ), 9580+9585 in (γ,γ′); the second component has J^π=(1−,2+) in (α,γ). $T_{1/2}$: from (γ,γ′).
9596 *4*			F	
9608 *5*			F	
9617 *3*	1−[&a]		F J	
9656 *4*	1−[a]		F	
9669 *4*	1−[a]		F	
9690 *5*	(1−,2+)[a]		F	E(level),Jπ: doublet:9687+9694 with the same J^π for both.
9736 *3*	1−[a]		F	
9757 *3*	1+[&]	0.56 eV *22*	F J	Jπ: (1−,2+) from γ(θ) and natural parity in (α,γ):resonances. $T_{1/2}$: from (γ,γ′).
9769 *4*	(1−,2+)[a]		F	
9787 *4*	1−[a]		F	

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Adopted Levels, Gammas (continued)

^{40}Ar Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[@]	XREF	Comments
9813 *3*	1^-[a]		F	
9825 *3*	1^-[a]		F	
9840 *3*	1^-[&]		J	
9851 *2*	1^-[&a]	21 eV *4*	F J	E(level): doublet: 9849+9852 in (α,γ). $T_{1/2}$: from (γ,γ′). 22 eV *6* from ^{36}S(α,γ):resonances.
9866 *4*			F	
9881 *4*	1^-[a]		F	
9893 *4*	1^-[a]		F	
9912 *5*	$(1^-,2^+)$[a]		F	
9944 *3*	1^-[a]		F	
9952 *3*	1^-[&]	10 eV *3*	F J	E(level): weighted average of 9954 *3* from (α,γ), 9950 *3* from (γ,γ′). $T_{1/2}$: from (γ,γ′). ≥9.6 eV from ^{36}S(α,γ):resonances.
10090 *3*	1^-[&]		J	
10151 *3*	1^-[&]		J	
10179 *2*	1^-[&]		J	
10362 *3*	$1,2^+$[&]		J	
10745 *3*	1^-[&]		J	
10857 *3*	1^-[&]		J	
11769[‡f]	(12^+)[b]		E	
17.7×10^3 *2*	2^+		Q	E(level),Jπ: isoscalar giant-quadrupole resonance with L(α,α′)=2.

[†] From a least-squares fit to γ-ray energies if values with uncertainties are available, otherwise, from (α,pγ) up to 6979 level and from (α,γ):resonances after 8919 level if available, unless otherwise noted.

[‡] From ^{26}Mg(^{18}O,2p2nγ).

[#] In (d,^{3}He) reaction, ^{41}K target J^π(g.s.)=$3/2^+$.

[@] Values of half-lives are from (α,pγ), unless otherwise noted; widths are from (γ,γ′) and/or (α,γ). Some half-lives are also available from (p,p′γ) and (α,γ) and weighted averages are taken when values are from more than one reactions. In addition to the width values from (γ,γ′) given here for levels with known γ-decay branching ratios, width data for other levels (mostly α-unbound) with unknown γ-decay branching ratios are also available in that dataset.

[&] From (γ,γ′), based on γ(θ) in (γ,γ′), parity from polarization asymmetry if available.

[a] From (α,γ):resonances, based on γ(θ) and natural parity.

[b] From ^{26}Mg(^{18}O,2p2nγ) based on γ(DCO) and band assignment.

[c] Band(A): Member of $f^2_{7/2}$ yrast sequence.

[d] Band(B): Band based on 5^-, α=1.

[e] Band(C): Band based on (6^-), α=0.

[f] Band(D): SD band. Q(transition)=1.45 *+49−31*(stat) *15*(syst) (2010Id02) from ^{26}Mg(^{18}O,2p2nγ). Possible configuration=$\pi[(d5/2)^{-1.2}(s_{1/2}d_{3/2})^{-3.8}\ (fp)^{2.5}(g_{9/2})^{0.5}]\otimes\nu[(d5/2)^{-0.7}(s_{1/2}d_{3/2})^{-2.4}\ (fp)^{4.5}(g_{9/2})^{0.5}]$.

Adopted Levels, Gammas (continued)

γ(^{40}Ar)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	δ[@]	Comments
1460.849	2^+	1460.820 *5*	100	0	0^+	E2		B(E2)(W.u.)=9.0 *4* E_γ: from ^{40}K ε decay. Other: 1460.73 *5* from ^{40}Cl β^- decay. Mult.: from γ(θ,pol) in ^{26}Mg(^{16}O,2pγ), γ(θ) in ^{40}Ar(p,p′γ) and ce data in ^{40}K ε decay.
2120.91	0^+	660.1 *4*	100	1460.849	2^+	[E2]		B(E2)(W.u.)=5.3 *8* E_γ: from ^{40}Cl β^- decay.
2524.09	2^+	403[&]	<1.7	2120.91	0^+			E_γ,I_γ: from ^{40}Ar(p,p′γ).
		1063.1 *2*	100 *2*	1460.849	2^+	M1+E2	−0.41 *+6−13*	B(M1)(W.u.)=0.037 *6*; B(E2)(W.u.)=18 *5* I_γ: from ^{37}Cl(α,pγ). Others: 100 *10* from ^{40}Cl β^- decay, and 100 *3* from ^{40}Ar(p,p′γ). Mult.,δ: from (p,p′γ).
		2524.1 *2*	74 *2*	0	0^+	E2		B(E2)(W.u.)=1.19 *18* I_γ: weighted average of 86 *10* from ^{40}Cl β^- decay, 75.4 *18* from ^{37}Cl(α,pγ), and 69 *3* from ^{40}Ar(p,p′γ). Mult.: Q from (p,p′γ); M2 is ruled out by RUL.
2892.65	4^+	369.0 *6*	1.0 *5*	2524.09	2^+	[E2]		B(E2)(W.u.)=5×10^1 *3*
		1431.82 *10*	100 *10*	1460.849	2^+	E2		B(E2)(W.u.)=5.9 *9* E_γ: weighted average of 1432.1 *4* from ^{40}Cl β^- decay and 1431.80 10 from ^{37}Cl(α,pγ). Additional information 1. Mult.: from γ(θ,pol)in ^{26}Mg(^{16}O,2pγ), γ(θ) in (p,p′γ); M2 is ruled out by RUL.
3207.93	2^+	315.0 *5*	0.9 *3*	2892.65	4^+	[E2]		B(E2)(W.u.)=5.1×10^3 *21* is much higher than allowed by RUL.
		1087.6 *4*	3.0 *15*	2120.91	0^+	[E2]		B(E2)(W.u.)=35 *19*
		1746.5 *2*	100 *1*	1460.849	2^+	M1+E2	+0.11 *7*	B(M1)(W.u.)=0.104 *22*; B(E2)(W.u.)=1.3 *+17−13* I_γ: from ^{37}Cl(α,pγ). Others: 100 *9* from ^{40}Cl β^- decay and 100 *3* from ^{40}Ar(p,p′γ). Mult.,δ: D+Q from γ(θ) in (p,p′γ), polarity from no level-parity change determined from other evidence.
		3208.2 *3*	11.7 *16*	0	0^+	[E2]		B(E2)(W.u.)=0.61 *16* I_γ: weighted average of 18 *3* from ^{40}Cl β^- decay, 11.1 *11* from ^{37}Cl(α,pγ), and 10 *3* from ^{40}Ar(p,p′γ).
3464.56	6^+	571.91 *8*	100	2892.65	4^+	E2		B(E2)(W.u.)=1.67 *6* E_γ: from (α,pγ). Mult.: from γ(θ,pol) in ^{26}Mg(^{16}O,2pγ), γ(θ) in (α,pγ); M2 is ruled out by RUL.
3511.54	2^+	303.0 *6*	3.2 *18*	3207.93	2^+			I_γ: weighted average of 5 *3* from ^{40}Cl β^- decay and 2.2 *23* from ^{40}Ar(p,p′γ).
		621.1 *6*	2 *2*	2892.65	4^+	[E2]		B(E2)(W.u.)=2.0×10^2 *+21−20* I_γ: from (α,pγ).

$^{40}_{18}Ar_{22}$-9

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [#]	E_f	J_f^π	Mult. [@]	δ [@]	Comments
3511.54	2+	987	6.2 *12*	2524.09	2+			I_γ: from (α,pγ).
		2050.5 *4*	100 *2*	1460.849	2+	M1(+E2)	−0.05 *11*	B(M1)(W.u.)=0.034 *7* I_γ: from ^{40}Ar(p,p′γ). Others: 100 *15* from ^{40}Cl β− decay, 100 *4* from ^{37}Cl(α,pγ). Mult.,δ: D(+Q) from γ(θ) in (p,p′γ), polarity from no level-parity change determined from other evidence.
		3511.0 *5*	14.7 *17*	0	0+	[E2]		B(E2)(W.u.)=0.26 *6* I_γ: weighted average of 15 *6* from ^{40}Cl β− decay, 17.3 *25* from ^{37}Cl(α,pγ), and 12.4 *23* from ^{40}Ar(p,p′γ).
3515	4+	622	52 *3*	2892.65	4+	M1(+E2)	−0.07 *10*	B(M1)(W.u.)=0.20 *5* Mult.,δ: D(+Q) from γ(θ) in (α,pγ); E1(+M2) ruled out by RUL.
		991	15 *8*	2524.09	2+	[E2]		B(E2)(W.u.)=5×10^1 *3*
		2054	100 *3*	1460.849	2+	[E2]		B(E2)(W.u.)=8.2 *18*
3680.60	3−	170[&]	<8	3511.54	2+			E_γ,I_γ: from (p,p′γ).
		472.0 *4*	3.5 *12*	3207.93	2+	[E1]		B(E1)(W.u.)=0.0012 *5*
		788.1 *3*	11.9 *12*	2892.65	4+	[E1]		B(E1)(W.u.)=0.00086 *21* I_γ: weighted average of 11.6 *12* from ^{40}Cl β− decay, 11.6 *12* from ^{37}Cl(α,pγ), and 18 *4* from ^{40}Ar(p,p′γ).
		1156.2 *4*	5.2 *7*	2524.09	2+	[E1]		B(E1)(W.u.)=0.00012 *3* I_γ: weighted average of 7.0 *12* from ^{40}Cl β− decay, 4.7 *6* from ^{37}Cl(α,pγ), and 7 *4* from ^{40}Ar(p,p′γ).
		2220.0 *2*	100 *2*	1460.849	2+	E1(+M2)	−0.07 *+5−11*	B(E1)(W.u.)=0.00032 *7* I_γ: from ^{37}Cl(α,pγ). Others: 100 *14* from ^{40}Cl β− decay, and 100 *4* from ^{40}Ar(p,p′γ). Mult.,δ: D(+Q) from pγ(θ) in (p,p′γ), polarity from level-parity change determined from other evidence.
		3681[&]	<6	0	0+	[E3]		B(E3)(W.u.)<3×10^2
3918.85	2+	239.0 *3*	1.4 *8*	3680.60	3−	[E1]		B(E1)(W.u.)=0.0012 *7* E_γ: from ^{40}Cl β− decay, observed in (p,p′γ) but not in (α,pγ). I_γ: scaled from Iγ(2457.7)=30 *3* from (α,pγ) by the factor of Iγ(239.0)/Iγ(2457.7)=4.8 *23*/100 *17* from ^{40}Cl β− decay.
		1394.7 *3*	22 *3*	2524.09	2+			I_γ: from (α,pγ). Others: 13.6 *17* from (p,p′γ), 26 *4* from ^{40}Cl β− decay.
		1797.8 *2*	15 *3*	2120.91	0+	[E2]		B(E2)(W.u.)=1.1 *3* I_γ: from (α,pγ). Others: 20 *3* from (p,p′γ), 47 *7* from ^{40}Cl β− decay.
		2457.7 *4*	30 *3*	1460.849	2+	M1+E2		I_γ: from (α,pγ). Others: 36 *5* from (p,p′γ), 100 *17* from ^{40}Cl β− decay. Mult.: D+Q from γ(θ) in (p,p′γ), polarity from no level-parity change determined from other evidence. δ: <−0.3 or >+6 from (p,p′γ).
		3918.6 *2*	100 *7*	0	0+	E2		B(E2)(W.u.)=0.154 *21* I_γ: from (α,pγ). Others: 100 *5* from (p,p′γ), 83 *9* from ^{40}Cl β− decay. It is seen

$^{40}_{18}Ar_{22}$-10

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	δ[@]	Comments
								from the gamma spectrum in 1972Kl06 in ^{40}Cl β^- decay that the 3919 single−escape−peak+full−energy−peak is much stronger than the 2458 peak. It is possible that the intensity of 3919 single-escape peak is not taken into account for the total intensity of the 3919 gamma-ray by 1972Kl06.
								Mult.: Q from γ(θ) in (p,p′γ); M2 is ruled out by RUL.
3941.9?		3941.7[&] *2*	100	0	0^+			
4042	NATURAL	1518 *2*	100 *16*	2524.09	2^+			E_γ: from (p,p′γ).
								I_γ: from ^{36}S(α,γ):resonances. Other: 100 *22* from ^{40}Ar(p,p′γ).
		2581	62 *16*	1460.849	2^+			I_γ: weighted average of 59 *16* from ^{36}S(α,γ):resonances and 67 *22* from ^{40}Ar(p,p′γ).
4082.63	3^-	1558.7 *4*	3.3 *4*	2524.09	2^+	[E1]		B(E1)(W.u.)=0.00012 *5*
		2621.7 *2*	100 *9*	1460.849	2^+	[E1]		B(E1)(W.u.)=0.0008 *3*
		4082.1 *8*	1.7 *3*	0	0^+	[E3]		B(E3)(W.u.)=2.7×10^2 *11*
4178.9?		4178.7[&] *3*	100	0	0^+			
4230	$4^{(-)}$	547 *2*	89 *4*	3680.60	3^-	D+Q	−10 *+3−9*	E_γ: from (p,p′γ).
								Mult.,δ: based on γ(θ,pol) in (α,pγ).
		1338 *2*	100 *4*	2892.65	4^+	D(+Q)	+0.6 *+4−8*	Mult.,δ: based on γ(θ) in (α,pγ).
								E_γ: from (p,p′γ).
4232	$(1^+,2^-,3^+)$	1708 *2*	100 *4*	2524.09	2^+			E_γ: from (p,p′γ).
		2771	30 *4*	1460.849	2^+			
4301.08	$(3)^-$	621.1 *6*	<0.9	3680.60	3^-			
		1092.9 *8*	1.0 *2*	3207.93	2^+	[E1]		B(E1)(W.u.)=8×10^{-5} *3*
		1776.9 *8*	0.06 *1*	2524.09	2^+	[E1]		B(E1)(W.u.)=1.1×10^{-6} *4*
		2840.1 *3*	100 *15*	1460.849	2^+	[E1]		B(E1)(W.u.)=0.00043 *14*
4324.5	2^+	2864	43 *9*	1460.849	2^+			I_γ: from from ^{36}S(α,γ):resonances. Not seen in ^{40}Cl β^- decay. Other: 100 *7* from (α,pγ).
		4324.2 *3*	100 *9*	0	0^+	[E2]		B(E2)(W.u.)=0.8 *4*
								I_γ: from ^{36}S(α,γ):resonances. Other: 41 7from (α,pγ).
4358.0		4357.6[&] *3*	100	0	0^+			
4420	$(2^+,3^-)$	1212	11 *2*	3207.93	2^+			
		1896	10 *2*	2524.09	2^+			
		2959	100 *5*	1460.849	2^+			E_γ: 2958 *3* from (p,p′γ).
4427	(4^+)	1534	75 *9*	2892.65	4^+	D+Q		Mult.: from (α,pγ) based on γ(θ).
								δ: −0.2 to +1.0 from (α,pγ) based on γ(θ).
		2966	100 *9*	1460.849	2^+	[E2]		B(E2)(W.u.)=1.4 *3*
4473	1	4473 *3*	100	0	0^+			
4481.0	1^-	4480.7 *3*	100	0	0^+	D		Mult.: based on γ(θ) in (p,p′γ).
4494	5^-	264	3.0 *5*	4230	$4^{(-)}$			I_γ: from (α,pγ).

$^{40}_{18}Ar_{22}$-11

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	δ[@]	Comments
4494	5^-	979	15 *2*	3515	4^+	[E1]		B(E1)(W.u.)=0.000113 *23* I_γ: from (α,pγ).
		1029	46 *3*	3464.56	6^+	D(+Q)	+0.06 *+7−10*	I_γ: from (α,pγ). Mult.,δ: from (α,pγ), based on γ(θ).
		1601	100 *5*	2892.65	4^+	E1(+M2)	0.00 *+6−9*	B(E1)(W.u.)=0.00017 *3* I_γ: from (α,pγ). Mult.,δ: from (α,pγ), based on γ(θ,pol).
4562.36	$(1,3)^-$	261.2 *7*	7.1 *7*	4301.08	$(3)^-$			
		479.9 *4*	7.9 *14*	4082.63	3^-			I_γ: other: 18.4 *21* from (α,pγ).
		643.6 *3*	59 *4*	3918.85	2^+			I_γ: other: 86 *8* from (α,pγ).
		881.3 *3*	22.9 *22*	3680.60	3^-			
		1051.1 *5*	4.3 *7*	3511.54	2^+			
		1353.7 *5*	1.8 *7*	3207.93	2^+			
		3101.7 *4*	100 *14*	1460.849	2^+			I_γ: other: 100 *8* from (α,pγ).
4578	$3^{(-)}$	222.5[&] *5*		4358.0				E_γ: observed only in ^{40}Cl β^- decay.
		1067	90 *10*	3511.54	2^+			
		1370	38 *5*	3207.93	2^+			
		1685	100 *10*	2892.65	4^+	D+Q		Mult.: based on γ(θ) in (α,pγ). δ: −0.05 to +0.72 for J=3 based on γ(θ) in (α,pγ).
		3117	28 *5*	1460.849	2^+			
		4580.1[&] *5*		0	0^+	[E3]		E_γ: observed only in ^{40}Cl β^- decay.
4602		2078	100 *2*	2524.09	2^+			
		3141	11 *2*	1460.849	2^+			
4674	$(1^+,2^-,3^+)$	3213	100	1460.849	2^+			
4737.8?		4737.5[&] *4*	100	0	0^+			
4769.0	1^-	4768.7 *3*	100	0	0^+			
4794	4^+	1901	100 *10*	2892.65	4^+	M1+E2		Mult.,δ: based on γ(θ,pol) in (α,pγ) with δ(E2/M1)=0.22 *+13−5* or +1.60 *15*.
		3333	100 *10*	1460.849	2^+	[E2]		B(E2)(W.u.)=1.6 *5*
4858	5^-	364	15 *8*	4494	5^-			
		1394	36 *2*	3464.56	6^+	[E1]		B(E1)(W.u.)=0.0014 *4*
		1965	100 *3*	2892.65	4^+	E1(+M2)	−0.09 *+8−12*	B(E1)(W.u.)=0.0014 *4* Mult.,δ: based on γ(θ,pol) in (α,pγ).
4901?		4901[&] *3*		0	0^+			
4929	$(1^-$ to $4^+)$	1248	100 *8*	3680.60	3^-			
		2405	44 *6*	2524.09	2^+			
		3468	56 *6*	1460.849	2^+			
4942.6?		361.3[&] *5*	90 *20*	4578	$3^{(-)}$			
		381.0[&] *5*	100 *40*	4562.36	$(1,3)^-$			
4959	6^+	1444	100 *5*	3515	4^+	E2		B(E2)(W.u.)=7×10[1] *3* Mult.: based on γ(θ) in (α,pγ); RUL rules out M2.

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Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	Comments
4959	6^+	2066	56 *5*	2892.65	4^+	E2	B(E2)(W.u.)=7 *3* Mult.: based on $\gamma(\theta)$ in $(\alpha,p\gamma)$; RUL rules out M2.
4972	$(2^+,3,4^+)$	2079	100 *7*	2892.65	4^+		
		3511	69 *7*	1460.849	2^+		
4991	$4^{(-)}$	761	100 *2*	4230	$4^{(-)}$	(M1+E2)	Mult.,δ: from $\gamma(\theta$,pol) in $(\alpha,p\gamma)$, with δ(Q/D)=−0.13 to +0.77 or −0.72 to −1.5.
		909	11 *1*	4082.63	3^-		
		1310	10 *1*	3680.60	3^-		
5110?		5110[&] *3*		0	0^+		
5115	(5^-)	1651	100	3464.56	6^+		
5143	(5)	1628	20 *2*	3515	4^+		
		1678	100 *2*	3464.56	6^+		
5165.6	$(2)^+$	1650	100 *4*	3515	4^+		E_γ,I_γ: observed in $(\alpha,p\gamma)$ only. This strong transition is not seen in ^{40}Cl β^- decay. It could suggest that it may be misplaced.
		3704.6 *8*	43 *4*	1460.849	2^+		I_γ: from $(\alpha,p\gamma)$. Other: 100 *10* from ^{40}Cl β^- decay.
		5165.5[&] *10*	4 *2*	0	0^+		E_γ: observed in ^{40}Cl β^- decay only. I_γ: normalized to I(3704.6γ)=43 *4* from $(\alpha,p\gamma)$ by the factor of I(5165.5γ)/I(3704.6γ)=10 *5*/100 *10* from ^{40}Cl β^- decay.
5245	$(0^+$ to $4^+)$	3784	100	1460.849	2^+		
5269.6	$(1^-,3^-)$	1186.7 *4*	75 *8*	4082.63	3^-		
		1589.0 *3*	100 *17*	3680.60	3^-		
		2063.0 *10*	42 *17*	3207.93	2^+		
5293	(2^+)	3832	100	1460.849	2^+		
5310	(2^+)	748	23 *2*	4562.36	$(1,3)^-$		
		1228	85 *6*	4082.63	3^-		
		1629	100 *6*	3680.60	3^-		
		5309.6[&] *10*		0	0^+		E_γ: only transition observed from a level at 5310 in ^{40}Cl β^- decay, not observed in other studies. The evaluator has considered this transition as questionable.
5350		2457	100	2892.65	4^+		
5378	$(4^+,5,6^+)$	1863	42 *4*	3515	4^+		
		1913	55 *4*	3464.56	6^+		
		2485	100 *8*	2892.65	4^+		
5400.5	1^-	5400.1 *8*	100	0	0^+		
5508	NATURAL	1993	100	3515	4^+		
5544	$(0^+$ to $4^+)$	4083	100	1460.849	2^+		
5559	$(4^+,5^-,6^+)$	2044	46 *4*	3515	4^+		
		2094	61 *4*	3464.56	6^+		
		2666	100 *7*	2892.65	4^+		
5608.8	(1,2,3)	4147.7 *10*	100	1460.849	2^+		
5611		2147	100	3464.56	6^+		
5630		1203	100	4427	(4^+)		

$^{40}_{18}Ar_{22}$-13

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Comments
5630		5629.0[&] *10*		0	0^+	E_γ: only transition observed from a level at 5630 in ^{40}Cl β^- decay, not observed in other studies. The evaluator has considered this transition as questionable.
5654		3130	100	2524.09	2^+	
5662		2769	100	2892.65	4^+	
5675	$(3^-,4^+)$	1994	100	3680.60	3^-	
5717.8?		3193.7[&] *10*	100	2524.09	2^+	
5766		2558	100	3207.93	2^+	
5818	$(3^-,4^+)$	2925	100	2892.65	4^+	
5880.3	1^-	1317.2 *5*	10 *1*	4562.36	$(1,3)^-$	
		1579.9 *8*	8 *2*	4301.08	$(3)^-$	
		3356.6 *8*	8 *3*	2524.09	2^+	
		3759.9 *10*	2.6 *13*	2120.91	0^+	
		5879.6 *12*	100 *5*	0	0^+	
5885	3^-	2992	100 *7*	2892.65	4^+	
		4424	87 *7*	1460.849	2^+	
5906.0	(1^-)	3784.9 *6*	100	2120.91	0^+	
5912	1	5912 *3*	100	0	0^+	
5912	$(1^-$ to $4^+)$	1830	100 *10*	4082.63	3^-	
		2704	100 *10*	3207.93	2^+	
5931	$(2^+,3,4^+)$	3038	100 *6*	2892.65	4^+	
		4470	39 *6*	1460.849	2^+	
5950.5	(1,2)	5950.0 *10*	100	0	0^+	
5973	(6^-)	2508	100	3464.56	6^+	
6013	(7^-)	1519	100 *6*	4494	5^-	E_γ: 1522 from ^{26}Mg(^{18}O,2p2nγ).
		2548	100 *6*	3464.56	6^+	E_γ: 2553 from ^{26}Mg(^{18}O,2p2nγ).
6053.6	$1^{(-)}$	6053.1 *8*	100	0	0^+	
6100	$(1,2^+)$	4638 *3*	100 *7*	1460.849	2^+	E_γ: from (γ,γ′).
		6100	33 *7*	0	0^+	
6104		3211	100	2892.65	4^+	
6138		2674	100	3464.56	6^+	
6158	$(4^+,5,6^+)$	2693	100 *2*	3464.56	6^+	
		3265	15 *2*	2892.65	4^+	
6185		1691	100	4494	5^-	
6203		3310	100	2892.65	4^+	
6208.5	(1,2)	6208.0 *8*	100	0	0^+	
6270		2805	100	3464.56	6^+	
6276.0?	$1^-,2^-,3^-$	1333.4[&] *8*	100	4942.6?		
6305	$(4^+,5,6^+)$	2790	100 *8*	3515	4^+	
		2840	67 *8*	3464.56	6^+	
6338.7	1^-	6338.2 *11*	100	0	0^+	
6356	$(4^+$ to $7^-)$	1498	100 *8*	4858	5^-	

$^{40}_{18}Ar_{22}$-14

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	Comments
6356	(4$^+$ to 7$^-$)	2891	49 *8*	3464.56	6$^+$		
6421	(8$^-$)	2956[‡]		3464.56	6$^+$		
6450?		6450[&] *3*		0	0$^+$		
6476.0	1$^-$	6475.5 *8*	100	0	0$^+$		
6651.7		1042.3[&] *3*	100	5608.8	(1,2,3)		
6703	1	6703 *3*	100	0	0$^+$		
6806	(8$^+$)	1847	100	4959	6$^+$		E_γ: from (α,pγ). Other: 1841 from (^{18}O,2p2nγ).
6979	(8$^-$)	1006	100	5973	(6$^-$)		
7168	1	7168 *3*	100	0	0$^+$		
7246	1	7246 *3*	100	0	0$^+$		
7281	1	7281 *3*	100	0	0$^+$		
7519	1	7519 *3*	100	0	0$^+$		
7626	1	6168[&] *3*		1460.849	2$^+$		
		7626 *3*	100	0	0$^+$		
7688	(9$^-$)	709[‡]		6979	(8$^-$)		
		1671[‡]		6013	(7$^-$)		
7708	1$^-$	7708 *3*	100	0	0$^+$	E1	
7918	1$^-$	7918 *2*	100	0	0$^+$	E1	
7993	1$^-$	7993 *3*	100	0	0$^+$	E1	
7999	(10$^-$)	311[‡]		7688	(9$^-$)		
		1020[‡]		6979	(8$^-$)		
		1578[‡]		6421	(8$^-$)		
8032	1$^-$	6570[&] *3*		1460.849	2$^+$		
		8032 *3*	100	0	0$^+$	E1	
8163	1$^-$	6703[&] *2*		1460.849	2$^+$		
		8163 *2*	100	0	0$^+$	E1	
8191	1$^-$	8191 *3*	100	0	0$^+$	E1	
8303	1$^-$	8303 *3*	100	0	0$^+$	E1	
8552	1$^-$	8552 *3*	100	0	0$^+$	E1	
8585	1$^-$	8585 *3*	100	0	0$^+$	E1	
8644	1$^-$	8644 *3*	100	0	0$^+$	E1	
8676	1,2$^+$	8676 *3*	100	0	0$^+$		
8834	1$^-$	8834 *4*	100	0	0$^+$		
8884	1$^-$	8884 *3*	100	0	0$^+$	E1	
8918	1$^-$	8917 *3*	100	0	0$^+$	E1	B(E1)(W.u.)=0.0006 *3*
8946	(11$^-$)	947[‡]		7999	(10$^-$)		
		1258[‡]		7688	(9$^-$)		
9070	(10$^+$)	2269[‡]		6806	(8$^+$)		

$^{40}_{18}Ar_{22}$-15

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ †	I_γ #	E_f	J_f^π	Mult. @	Comments
9127	1^-	9128 *3*	100	0	0^+	E1	B(E1)(W.u.)=0.00118 *24*
9314	1^-	9313		0	0^+		
9337	1^-	9337 *3*	100	0	0^+		
9355	1^-	5054	7	4301.08	$(3)^-$		
		5436	8	3918.85	2^+		
		9356 *3*	100	0	0^+	E1	
9416	1^-	5333	54	4082.63	3^-		
		5497	40	3918.85	2^+		
		5904	51	3511.54	2^+		
		6891	9	2524.09	2^+		
		7954	31	1460.849	2^+		
		9416 *3*	100	0	0^+	E1	
9450	1^-	5938	23	3511.54	2^+		
		6242	23	3207.93	2^+		
		6557	11	2892.65	4^+	[E3]	
		6925	37	2524.09	2^+		
		7328	34	2120.91	0^+		
		7988	100	1460.849	2^+		
		9449	69	0	0^+		
9504.2	1^-	5585	3	3918.85	2^+		
		7383	2	2120.91	0^+		
		8043	7	1460.849	2^+		
		9503	100	0	0^+	E1	
9583	1^-	5664	12	3918.85	2^+		
		6690	12	2892.65	4^+	[E3]	
		7058	27	2524.09	2^+		
		7461	61	2120.91	0^+		
		8121	44	1460.849	2^+		
		9582 *3*	100	0	0^+	(E1)	
9617	1^-	5698	11	3918.85	2^+		
		5936	4	3680.60	3^-		
		6105	4	3511.54	2^+		
		6409	9	3207.93	2^+		
		6724	7	2892.65	4^+	[E3]	
		7092	15	2524.09	2^+		
		7495	7	2120.91	0^+		
		8155	100	1460.849	2^+		
		9616	67	0	0^+		
9690	$(1^-,2^+)$	5088	26	4602			
		5365	15	4324.5	2^+		
		5771	11	3918.85	2^+		
		6178	11	3511.54	2^+		

$^{40}_{18}Ar_{22}$-16

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ †	I_γ #	E_f	J_f^π	Mult. @	Comments
9690	$(1^-,2^+)$	6482	9	3207.93	2^+		
		7165	100	2524.09	2^+		
		8228	7	1460.849	2^+		
		9689	6	0	0^+		
9736	1^-	5134	10	4602			
		5817	27	3918.85	2^+		
		6528	23	3207.93	2^+		
		7211	10	2524.09	2^+		
		7614	15	2120.91	0^+		
		8274	23	1460.849	2^+		
		9735	100	0	0^+		
9757	1^+	9757 *3*	100	0	0^+	M1	B(M1)(W.u.)=0.029 *12*
9825	1^-	5906	40	3918.85	2^+		
		6144	36	3680.60	3^-		
		6313	8	3511.54	2^+		
		6617	52	3207.93	2^+		
		7300	68	2524.09	2^+		
		7703	28	2120.91	0^+		
		8363	100	1460.849	2^+		
		9824	68	0	0^+		
9840	1^-	9840 *3*	100	0	0^+		
9851	1^-	6958&	19	2892.65	4^+	[E3]	
		7326	60	2524.09	2^+		
		8389	53	1460.849	2^+		
		9850 *2*	100	0	0^+	E1	
9944	1^-	6025	13	3918.85	2^+		
		7419	61	2524.09	2^+		
		7822	24	2120.91	0^+		
		8482	66	1460.849	2^+		
		9943	100	0	0^+		
9952	1^-	5627	6	4324.5	2^+		
		5910	3	4042	NATURAL		
		6033	3	3918.85	2^+		
		7427	13	2524.09	2^+		
		8490	17	1460.849	2^+		
		9950 *3*	100	0	0^+	E1	
10090	1^-	10090 *3*	100	0	0^+	E1	
10151	1^-	10151 *3*	100	0	0^+	E1	
10179	1^-	10179 *2*	100	0	0^+	E1	
10362	$1,2^+$	10362 *3*	100	0	0^+		
10745	1^-	10745 *3*	100	0	0^+	E1	

$^{40}_{18}Ar_{22}$-17

Adopted Levels, Gammas (continued)

γ(^{40}Ar) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [#]	E_f	J_f^π	Mult. [@]
10857	1^-	10857 *3*	100	0	0^+	E1
11769	(12^+)	2699 [‡]		9070	(10^+)	

[†] Values with uncertainties are from ^{40}Cl β^- decay if available, otherwise from (γ,γ'), and those without uncertainties are for transitions reported in (α,pγ) up to 6979 level ($\Delta E\gamma$=1-2 keV) and in (α,γ):resonances after 8919 level ($\Delta E\gamma$=3-5 keV) and are taken from level-energy differences by evaluator, unless otherwise noted.

[‡] Observed in ^{26}Mg(^{18}O,2p2nγ) only.

[#] From ^{40}Cl β^- decay if available, otherwise from (α,pγ) up to 6979 level and from (α,γ):resonances after 8919 level, unless otherwise noted.

[@] From (α,pγ) based on measured $\gamma(\theta)$ and γ(lin pol) up to 6979 level, and from (γ,γ') based on polarization asymmetry after that, unless otherwise noted.

[&] Placement of transition in the level scheme is uncertain.

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

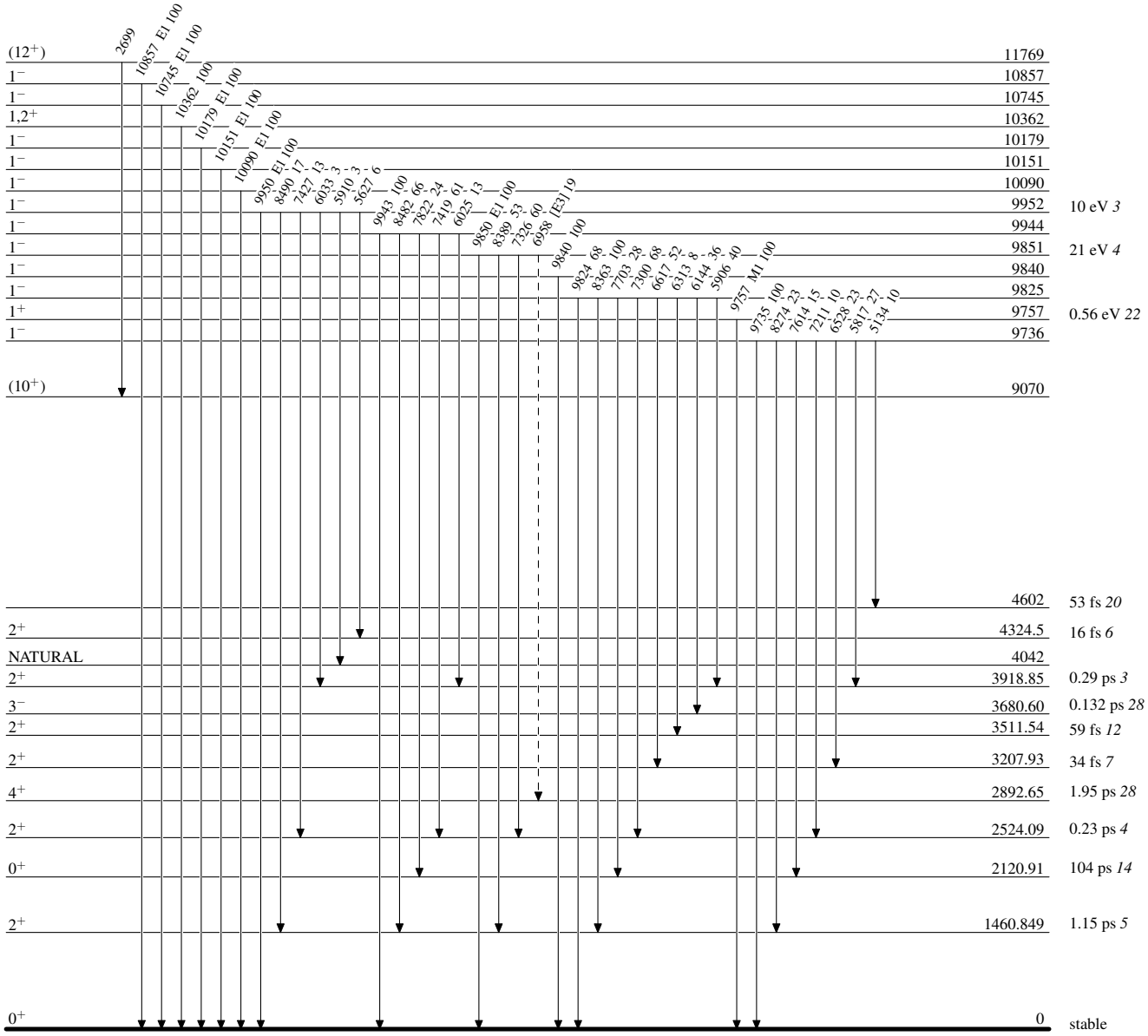
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)

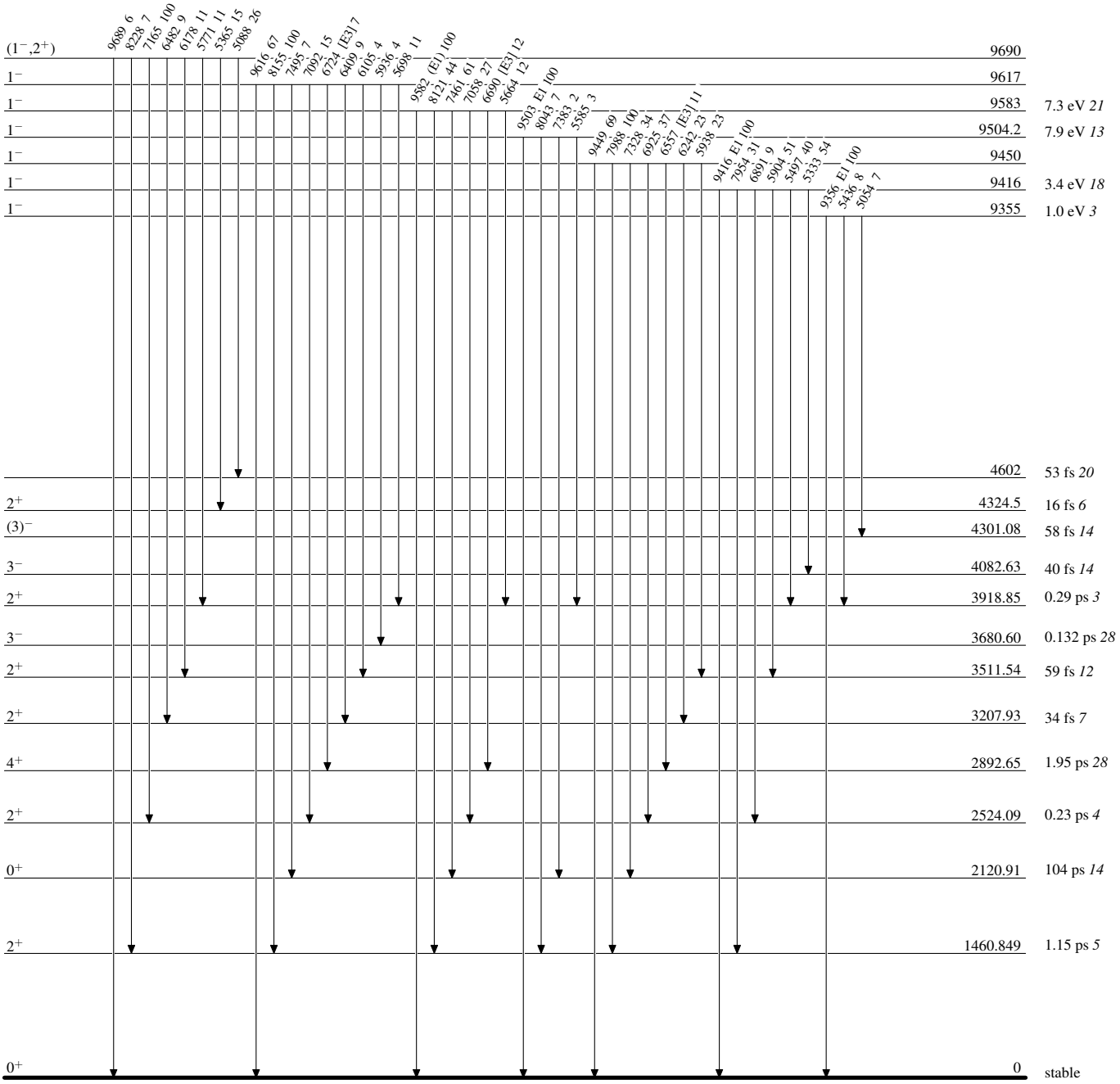


$^{40}_{18}Ar_{22}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



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

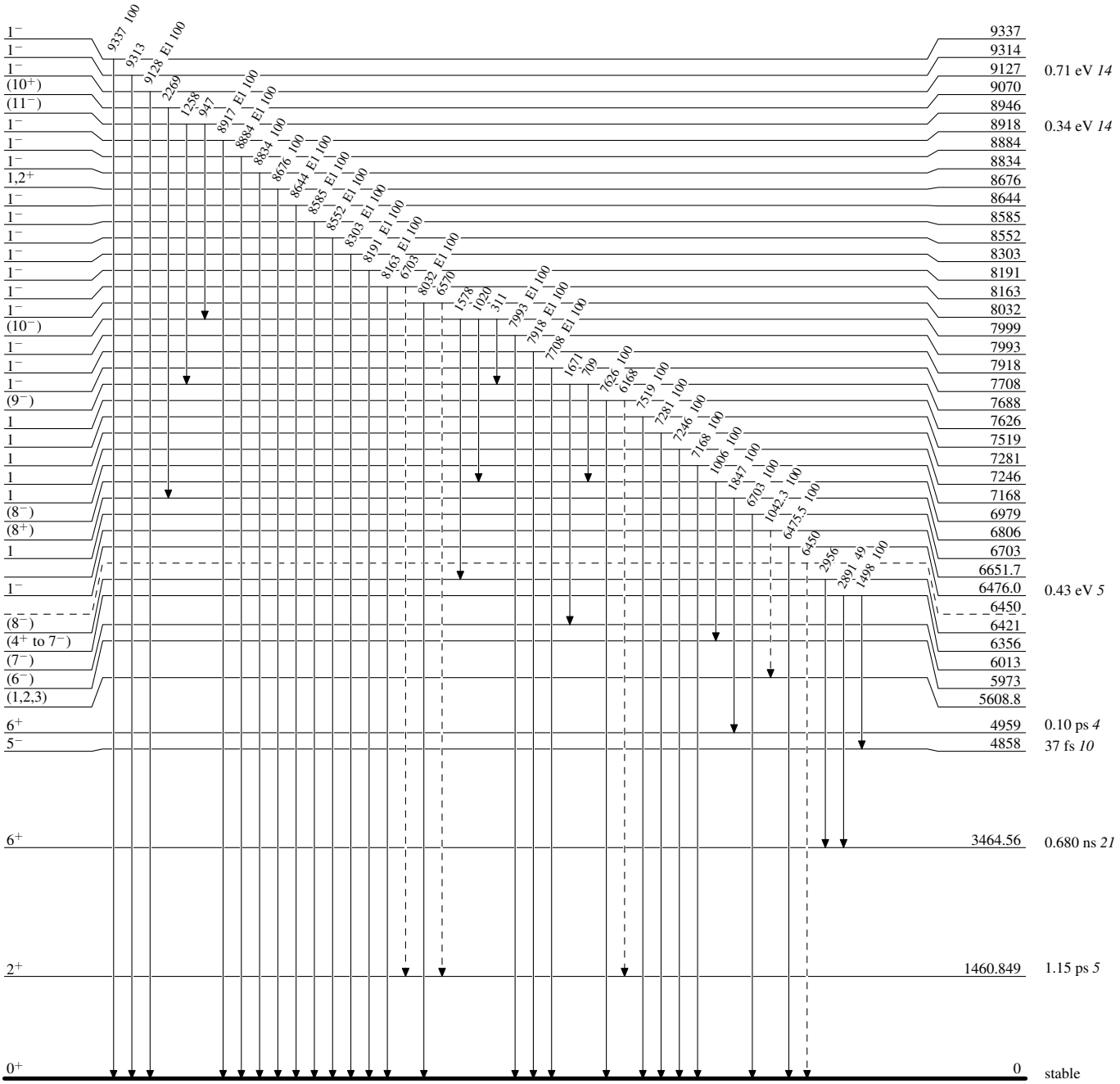
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

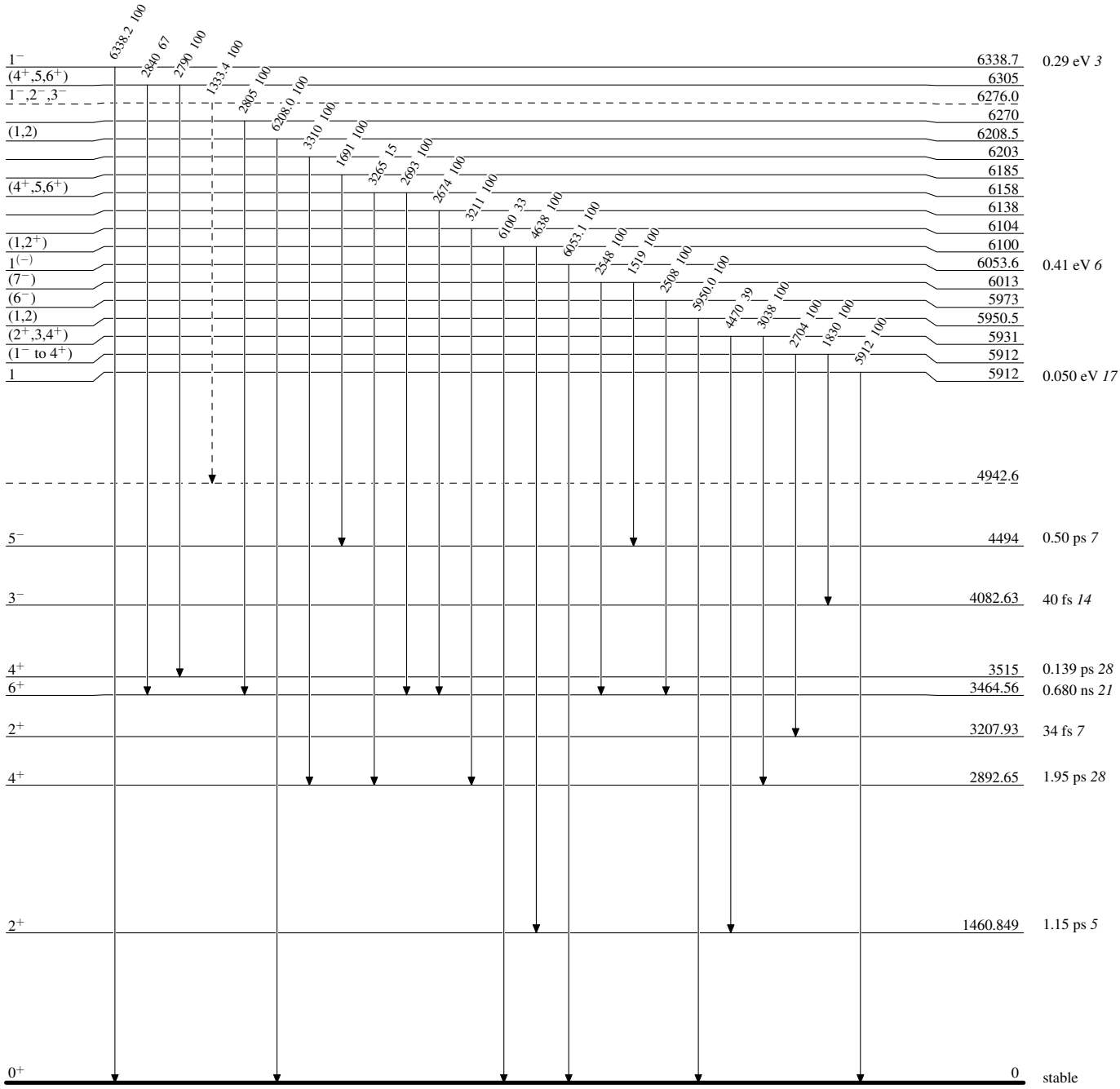
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

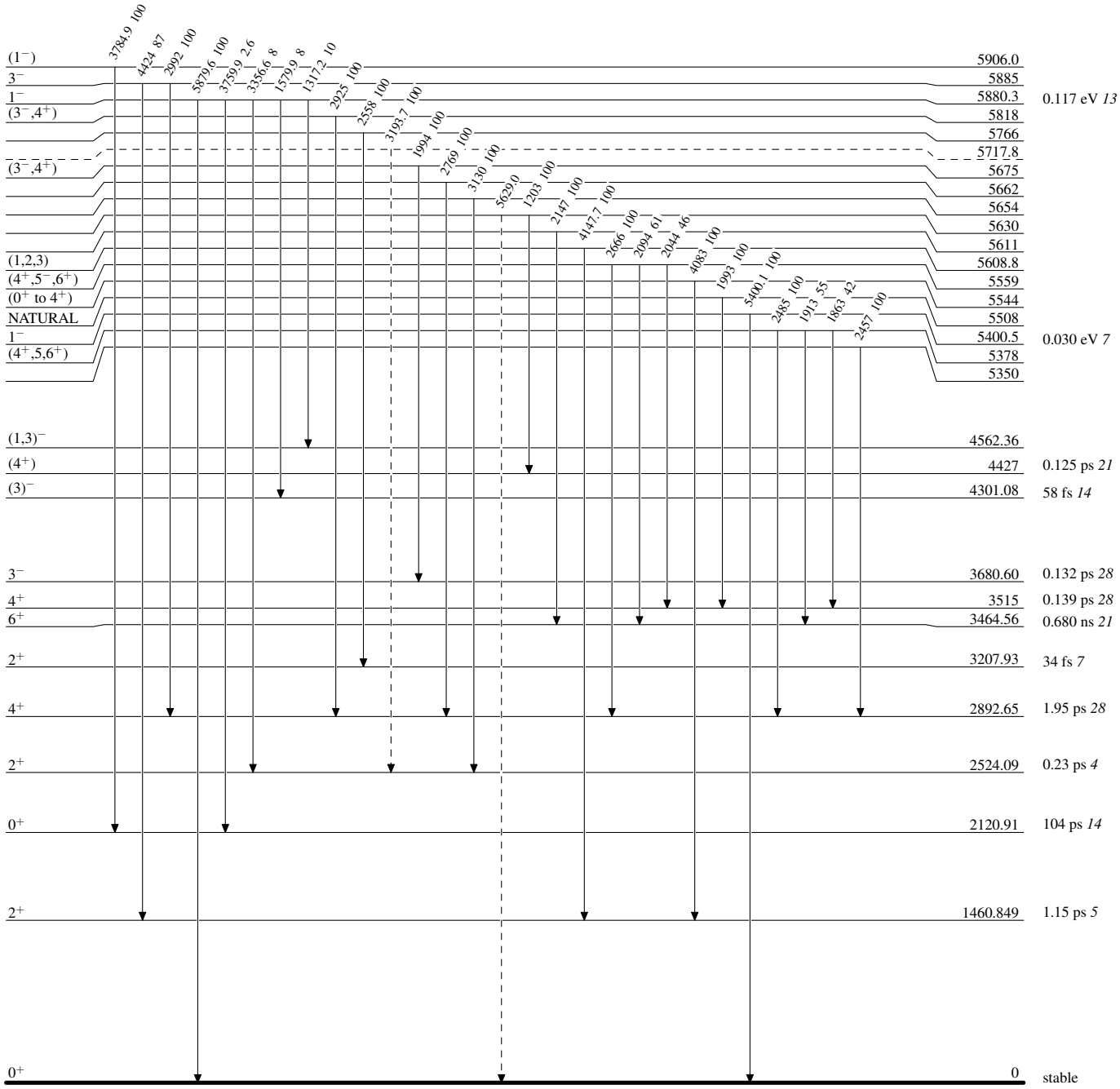
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

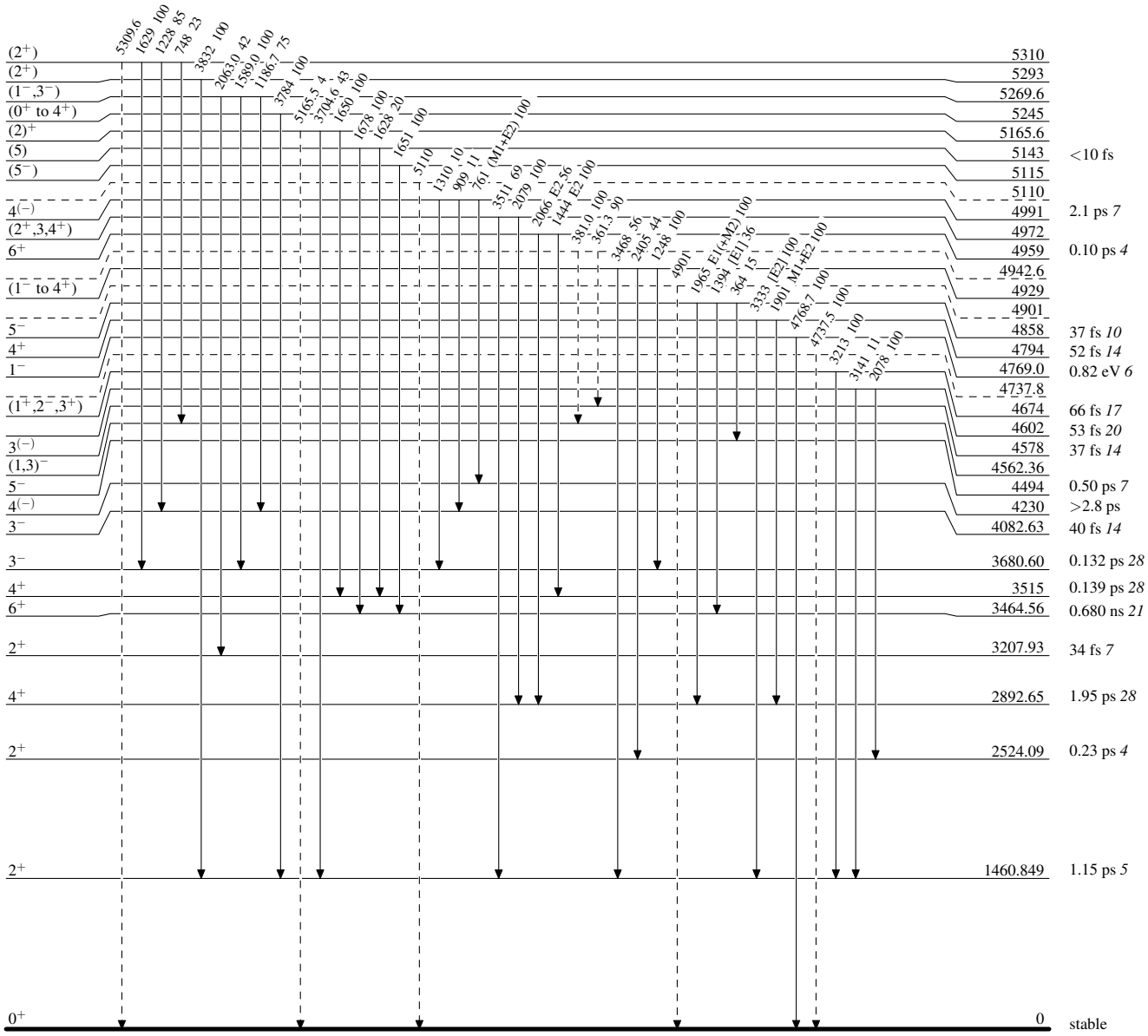
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

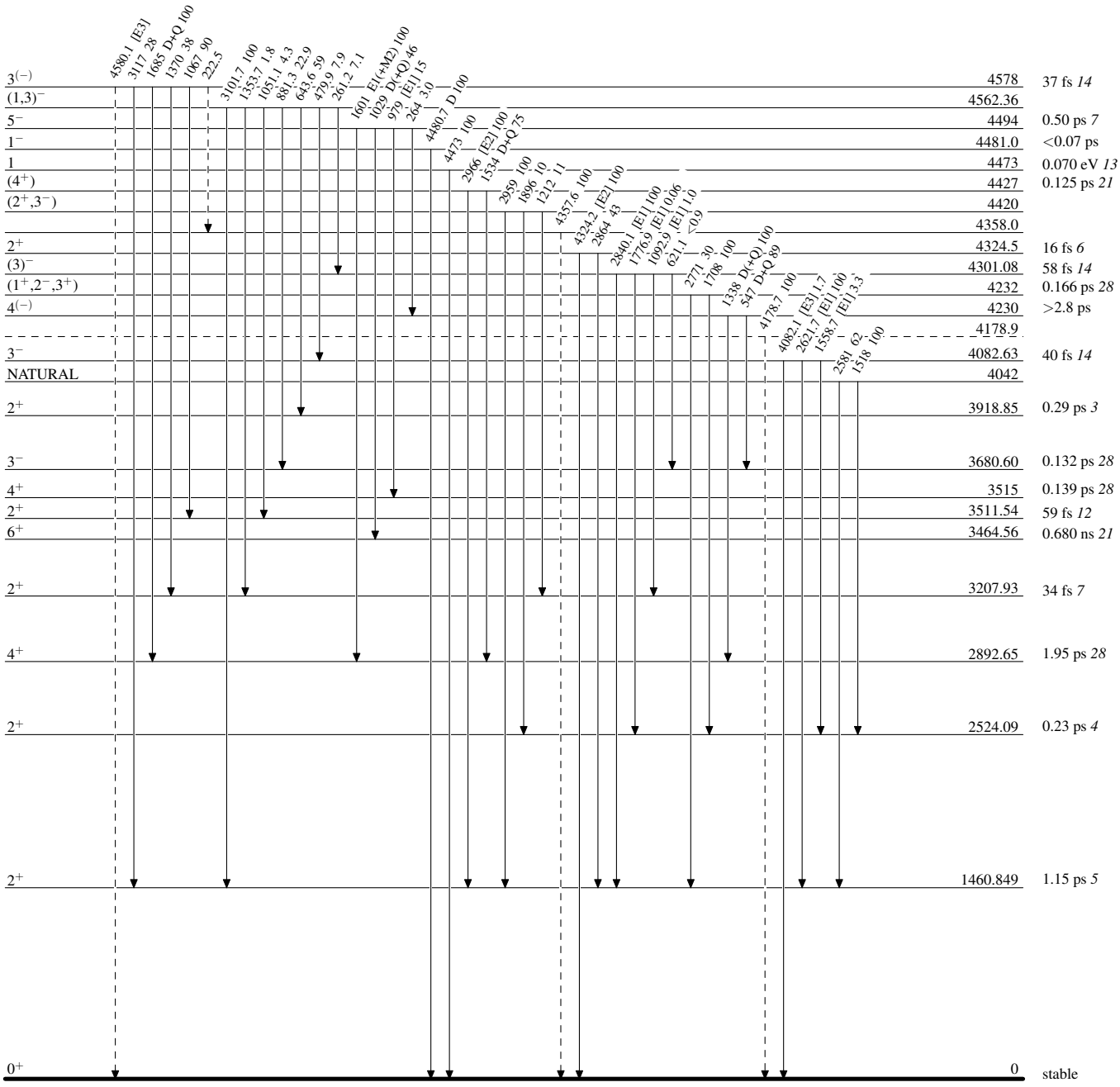
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

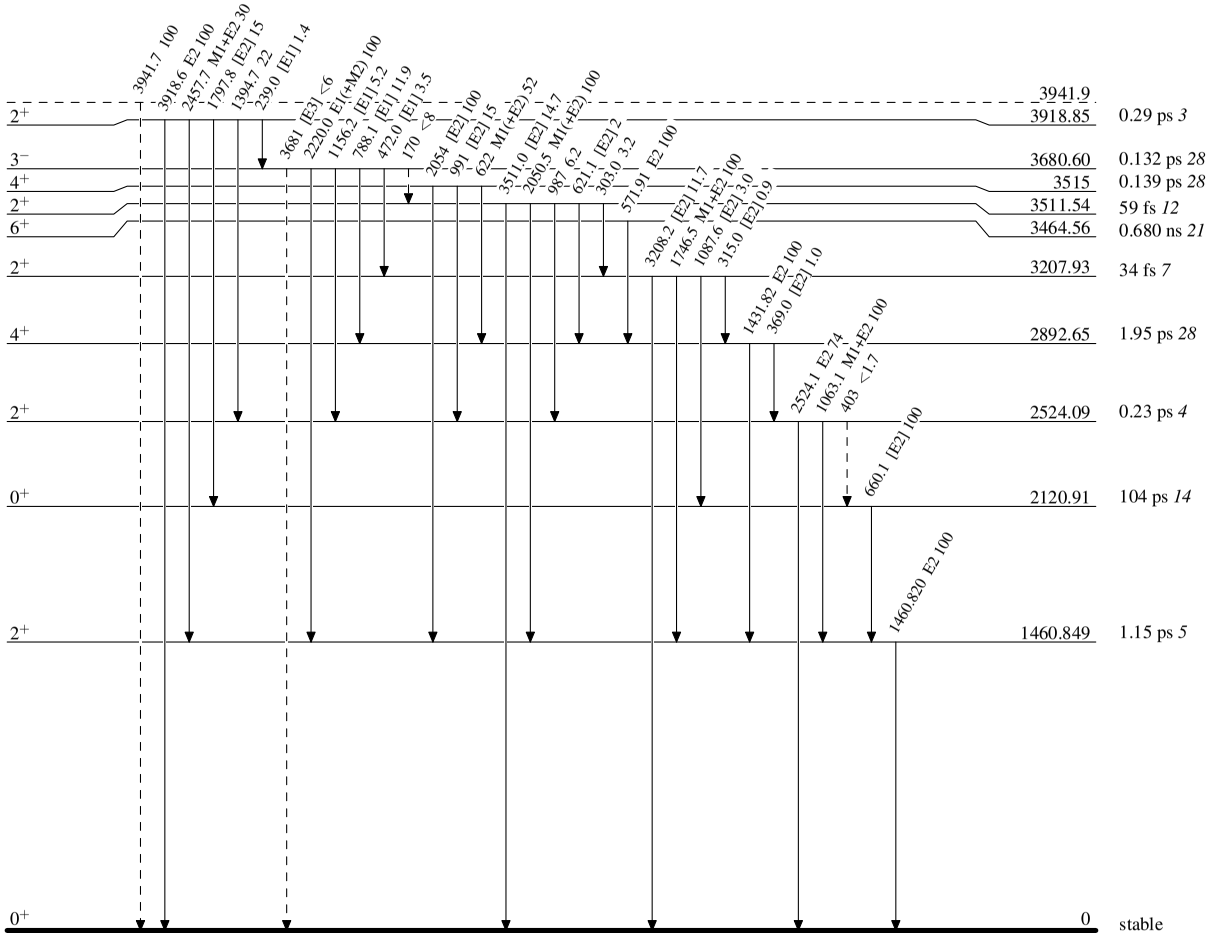
Adopted Levels, Gammas

Legend

Level Scheme (continued)

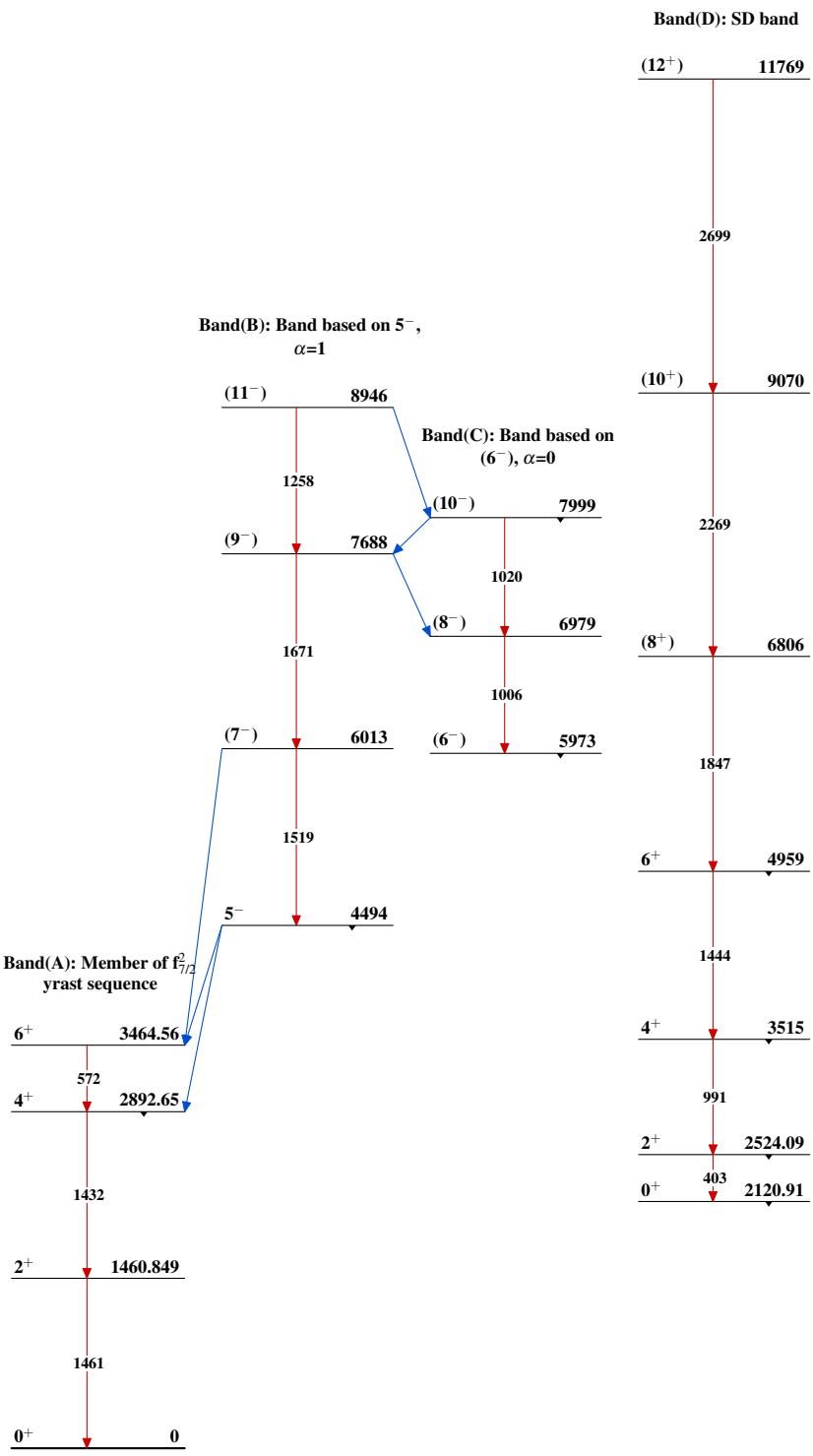
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

Adopted Levels, Gammas



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