Nuclear Data Sheets xx, 1 (****)

Nuclear Data Sheets for A=40

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*(Received ****)*

Abstract: Nuclear spectroscopic information for the known nuclides of mass 40 (Al,Si,P,S,Cl,Ar,K,Ca,Sc,Ti) has been evaluated. The principal sources of the Adopted Levels presented are Endt′s evaluations (1990En08,1978En02). The data sets for reactions and decays, including all available gamma-ray data, are based mostly on the original literature. There are no data available for the excited states in ^{40}Al, ^{40}Si, ^{40}P and ^{40}Ti. The identification and particle stability of ^{40}Mg are still uncertain, although search for this nuclide has been made (2002Lu09,2002No11,2003Pe31).

Cutoff Date: Literature available up to May 10, 2004 has been consulted.

General Policies and Organization of Material: See the January issue of the *Nuclear Data Sheets* or http:// www.nndc.bnl.gov /nds/NDSPolicies.pdf.

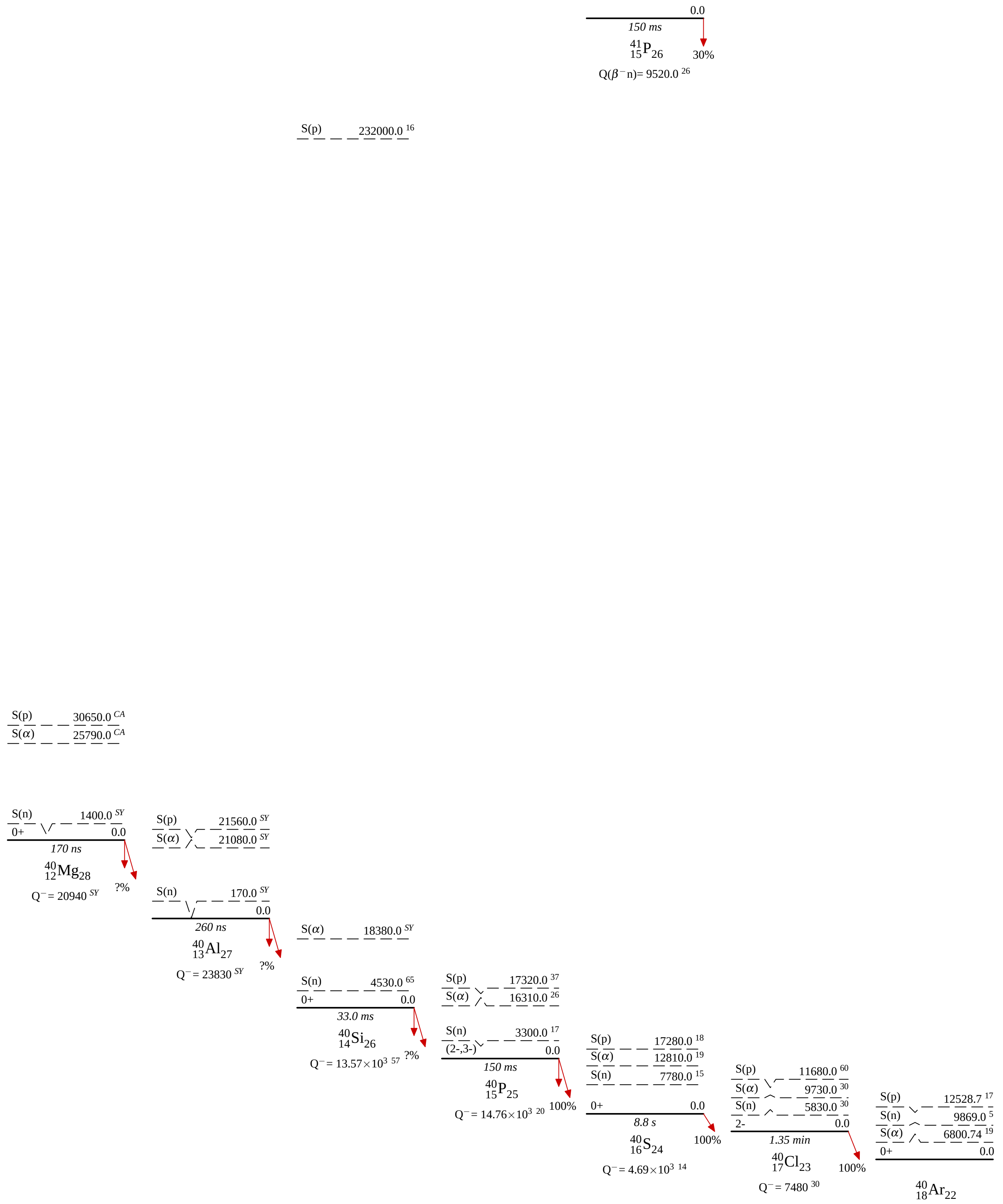
General Comments: Typ=ful; aut=john a. Cameron and balraj singh; cit=Nuclear Data.

Acknowledgements: Previous evaluations of Peter Endt and Cor van der Leun (1990En08 (including update 1998En04), 1978En02 and 1973EnVA) provided an invaluable resource for the current work. We thank Kamal K. Seth (Northwestern Univ.) for sending details of their (p,t) work (1977SeZR) on ^{40}Ca and Edward G. Bilpuch (Duke Univ. and TUNL) for sending a copy of 1987 thesis of his student Barry J. Warthen, giving details of (p,p_0) and (p,α_0) resonances in ^{40}Ca. The evaluators thank John H. Kelley (TUNL) for a review of this work and for many useful suggestions.

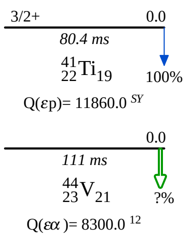
Citations: Nuclear Data Sheets 102, 293 (2004).

Index for A=40

Skeleton Scheme for A=40

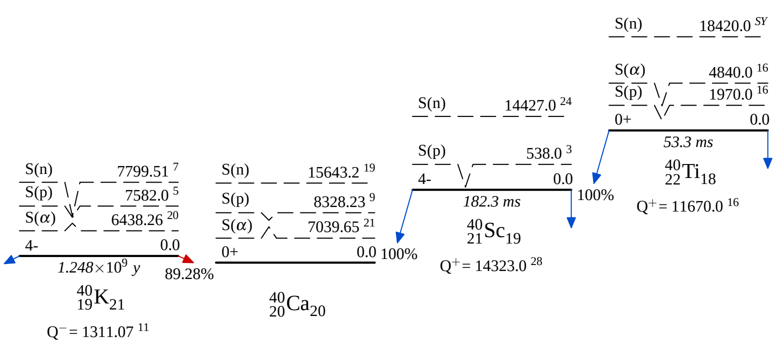


Skeleton Scheme for A=40 (continued)



Ground-State and Isomeric-Level Properties

Nuclide	Level	Jπ	$T_{1/2}$	Decay Mode
^{40}Mg	0.0	0+	> 170 ns	%β-=? ; %β^-n=?
^{40}Al	0.0		> 260 ns	%β-=? ; %β^-n=?
^{40}Si	0.0	0+	33.0 ms *10*	%β-=? ; %β^-n=?
^{40}P	0.0	(2-,3-)	150 ms *8*	%β-=100 ; %β^-n=15.8 *21*
^{40}S	0.0	0+	8.8 s *22*	%β-=100
^{40}Cl	0.0	2-	1.35 min *2*	%β-=100
^{40}Ar	0.0	0+	STABLE	
^{40}K	0.0	4-	1.248×10^9 y *3*	%β-=89.28 *13*; %ε+%β+=10.72 *13*
^{40}Ca	0.0	0+	STABLE	
^{40}Sc	0.0	4-	182.3 ms *7*	%ε+%β+=100 ; %εp=0.44 *7*; %εα =0.017 *5*
^{40}Ti	0.0	0+	53.3 ms *15*	%ε+%β+=100 ; %εp=100
^{41}P	0.0		150 ms *15*	%β^-n=30 *10*; %β^-n=30 *10*
^{41}Ti	0.0	3/2+	80.4 ms *9*	%εp=100 *10*; %εp=100 *10*
^{44}V	0.0		111 ms *7*	%εα =? ; %εα =?



Comments

Nuclear data sheets for ^{40}Mg.
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Canada, L8S 4M1.
Information about the particle stability of the ^{40}Mg nuclide is presented with positive identification of this nuclide in the work of 2007Ba71. The data presented in this update supersede those in the 2004Ca38 evaluation.
Literature available up to November 30, 2007 has been consulted.
ENSDF.
Research sponsored by the Natural Sciences and Engineering Research Council of Canada; the Nuclear Physics Office of the U.S. Department of Energy.

Adopted Levels

Q(β^-)=20940 *SY*; S(n)=1400 *SY*; S(p)=30650 *CA*; Q(α)=-25790 *CA* 2003Au03,1997Mo25
Δ(Q(β^-))=1140, Δ(S(n))=1040 (syst,2003Au03).
Q(β^-) and S(n) are from 2003Au03; S(p) and Q(α) are from 1997Mo25.
Q(β^-n)=20770 *1730* (syst,2003Au03).
First identification of ^{40}Mg nuclide as particle stable by 2007Ba71:.
2007Ba71: W(^{48}Ca,Xγ) E=141 MeV/nucleon beam from the National Superconducting Cyclotron Laboratory (NSCL). The fragments were separated with the A1900 fragment separator. Isotopic identification by multiple ΔE signals, magnetic rigidity, total energy and time of flight analysis. Detectors: plastic scintillators, parallel-plate avalanche counters (PPACs) and silicon PIN diodes.
A total of three events were assigned to ^{40}Mg. This establishes stability of ^{40}Mg against particle emission.
Earlier studies:.
2002Lu19 and 2002No11 (also 2003Pe31) searched for evidence for the formation of ^{40}Mg nuclide in fragmentation of ^{48}Ca beam at 59, 64 MeV/nucleon bombarding a ^{181}Ta target at RIKEN-RIPS facility. With a predicted cross section of 0.01 pb, only one event was expected; but none was observed. Thus the identification and particle stability of ^{40}Mg remained uncertain in this work.
Structure calculations: 2006Yo07 (transition strengths, QRPA); 2006Zh19 (binding energies, deformation parameters, B(E2)); 2004Ca34 (level energies, Q_2, B(E2), deformation); 2002Ro32 (levels, moments, potential energy surface); 1999Si13 (BE(2), electric quadrupole and magnetic moments); 1999La18 (B(E2), radii, deformation).

^{40}Mg Levels

E(level)	J^π	$T_{1/2}$	Comments
0	0+	>170 ns	%β-=? . %β^-n=? . $T_{1/2}$: limiting value estimated from time-of-flight of $\approx$170 ns (figure 3 in 2007Ba71) at NSCL facility. Actual half-life is expected to be much longer as suggested by 10 ms from systematics (2003Au02) and 24 ms from calculations by 1997Mo25.

Adopted Levels

Q(β^-)=23830 *SY*; S(n)=170 *SY*; S(p)=21560 *SY*; Q(α)=-21080 *SY* 2003Au03
Δ(Q(β^-))=890, Δ(S(n))=1630, Δ(S(p))=870, Δ(Q(α))=1180 (syst,2003Au03).
Q(β^-n)=19300 *780* (syst,2003Au03).
^{40}Al isotope identified in ^{181}Ta(^{48}Ca,X) reaction at E=70 MeV/nucleon (1997Sa14). A total of 34 events were observed in this study. In 1996Sa34 (from the same group as 1997Sa14) only one event was tentatively assigned to ^{40}Al.

^{40}Al Levels

E(level)	$T_{1/2}$	Comments
0.0	>260 ns	%β-=? . %β^-n=? . $T_{1/2}$: estimated from tof of the experimental arrangement(1997Sa14). Calculated $T_{1/2}$(β^- decay)=3.9 ms (1997Mo25); 10 ms (syst,2003Au02).

Comments

Nuclear data sheets for ^{40}Si.
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Nuclear Structure information for ^{40}Si has been evaluated, with the inclusion of excited states and gamma rays in this nuclide. This evaluation supersedes the information contained in Nuclear Data Sheets for A=40 (2004Ca38) when only the ground state was known.
All literature available up to Dec 20, 2006 has been considered.

Research sponsored by NSERC of Canada and US Department of Energy.
ENSDF.

Adopted Levels, Gammas

Q(β^-)=13.57×10^3 *57*; S(n)=4.53×10^3 *65*; S(p)=2.32×10^5 *16*; Q(α)=-18380 *SY* 2003Au03
Δ(Q(α))=750 (syst,2003Au03).
Q(β^-n)=10270 *570* (2003Au03).
1989Gu03: ^{40}Si produced and identified in ^{181}Ta(^{48}Ca,X) reaction at 55 MeV/nucleon.
2004Gr20 (also 2004Gr28,2003Gr22): ^{40}Si produced by fragmentation of ^{48}Ca beam at 60 MeV/nucleon with a ^{9}Be target followed by separation of fragments by LISE3 spectrometer; measured β, γ, $T_{1/2}$.
Mass measurement: 2000Sa21 (also 2001Sa72).
2006Kh08: Si(^{40}Si,X) E=30-65 MeV. Measured cross section, deduced radius and isospin dependence. Measured $<r_0^2>$=1.21 fm^2 *6*.

^{40}Si Levels

Cross Reference (XREF) Flags

A ^{40}Si(p,p'γ),^{42}P(p,Xγ)

E(level)	J$^\pi$	$T_{1/2}$	XREF	Comments
0	0+	33.0 ms *10*	A	%β-=? . %β^-n=? . $T_{1/2}$: from 2004Gr20 (also 2003Gr22,2004Gr28). Calculated $T_{1/2}$(β^- decay)=36.8 ms (1997Mo25). %β^-n=53 *12* (preliminary value from 1999YoZW).
986 *5*	(2+)		A	Jπ: systematics of even-even nuclides.
1624 *7*			A	
1831 *8*			A	

γ(^{40}Si)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ
986	(2+)	0	0+	986 *5*
1624		986	(2+)	638 *5*[a]
1831		986	(2+)	845 *6*[a]

[a] Weak γ seen only in the pn removal reaction from ^{42}P.

^{40}Si(p,p′γ),^{42}P(p,Xγ) 2006Ca26

Beams=^{40}Si and ^{42}P, target=liquid hydrogen (LH_2).

Beams of ^{40}Si and ^{42}P were obtained from fragmentation of primary beam of ^{48}Ca at 140 MeV/nucleon impinging upon a ^{9}Be target. The fragments were separated by A1900 fragment separator Bρ-ΔE-Bρ method at NSCL, Michigan facility. Prompt γ rays were detected by SeGa γ-detector array of 32-fold segmented HPGe detectors. FWHM ≈ 3% at 1 MeV.

^{40}Si Levels

E(level)	J^π
0	0+
986 *5*	2+
1624 *7*	
1831 *8*	

γ(^{40}Si)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	Comments
986	2+	0	0+	986 *5*	E_γ: most intense γ seen in both reactions.
1624		986	2+	638 *5*[a]	
1831		986	2+	845 *6*[a]	

[a] Weak γ seen only in pn removal reaction from ^{42}P.

Adopted Levels

$Q(\beta^-)=14.76\times10^3$ *20*; $S(n)=3.30\times10^3$ *17*; $S(p)=17.32\times10^3$ *37*; $Q(\alpha)=-16.31\times10^3$ *26* 2003Au03

$Q(\beta^-n)$=6980 *150* (2003Au03).

Mass measurement: 2001Sa21 (also 2001Sa72), 1991Zh24.

2003Gr22: ^{40}P produced by fragmentation of ^{48}Ca beam at 60 MeV/ nucleon with a ^{9}Be target followed by separation of fragments by LISE3 spectrometer; measured β, γ, $T_{1/2}$.

2001Wi21: ^{40}P was produced in the fragmentation of ^{48}Ca beam at E=70 MeV/nucleon with a Be target followed by analysis using using A1200 fragment separator.

Others:.

1989Le16: ^{40}P formed and identified in ^{181}Ta(^{48}Ca,X). Measured $T_{1/2}$ and %β^-n.

1979We10: ^{40}P produced in ^{9}Be(^{48}Ca,X) at 212 MeV/nucleon.

1999YoZW, in a preliminary result, suggested that ^{41}Si decays dominantly (>50%) by β^-n decay to ^{40}P, but final details of this study are not yet available.

^{40}P Levels

E(level)	J^π	$T_{1/2}$	Comments
0	(2-,3-)	150 ms *8*	%β-=100 . %β^-n=15.8 *21* 2001Wi21. Jπ: probable feeding (log *ft*=6.1) of 2+ state. Possible coupling of π1/2[211] and ν5/2[312] (see discussion in 2001Wi21). $T_{1/2}$: weighted average of 153 ms *8* (2001Wi21) and 125 ms *25* (2003Gr22). Other: 260 ms *+100-60* (1989Le16). %β^-n from 2001Wi21. Other: 30 *10* (1989Le16).

Adopted Levels, Gammas

Q(β^-)=4.69×10^3 *14*; S(n)=7.78×10^3 *15*; S(p)=17.28×10^3 *18*; Q(α)=-12.81×10^3 *19* 2003Au03
Mass measurement: 2000Sa21.
Other reactions:.
1999Ai02: (^{40}S,X) E=38-80 MeV/nucleon. Measured mean energy-integrated cross sections, deduced strong absorption radii, r_0^2=1.29 fm^2 8.
1997Fo01: ^{208}Pb(^{37}Cl,X) E=230 MeV. Measured yield.
1991Zh24: Th(p,X) E=800 MeV. Measured fragment mass, charge ratio. Deduced mass excess.
^{40}S identified by 1971Ar32 in ^{232}Th(^{40}Ar,X) E=290 MeV and by 1986Du07 in ^{9}Be(^{40}Ar,X) E=60 MeV/nucleon.

^{40}S Levels

Cross Reference (XREF) Flags

A	^{40}P β^- decay (150 ms)	D	Coulomb excitation
B	^{9}Be(^{48}Ca,Xγ)	E	^{41}P β^-n decay (150 ms)
C	^{40}S(p,p′)		

E(level)	J$^\pi$	$T_{1/2}$	XREF	Comments
0	0+	8.8 s *22*	ABCD	%β-=100 . $T_{1/2}$: from 1986Du07.
903.69 *7*	2+	15.9 ps *21*	ABCD	B(E2)=0.0334 *36* (1996Sa21). β_2(p,p′)=0.35 *5* (1999Ma63), β_2(Coul. ex.)=0.284 *16* (1996Sc31). Jπ: coulomb excited from 0+. $T_{1/2}$: from B(E2).
1916.84 *21*	(4+)		A	Jπ: γ to 2+; probable member of 2-phonon triplet. Jπ=0+ is not excluded but similarity with ^{42}Ar states suggests 4+ is more likely.
2254.79 *12*	(2+)		AB	Jπ: γ to 2+; probable member of 2-phonon triplet.
3236.1 *3*			A	Jπ: γ to (2+).
3489.46 *18*	(1,2+)		A	Jπ: γ to 0+.
3947.0 *3*			A	Jπ: γ to 2+.
4138.30 *20*	(1-,2-,3-)		A	Jπ: γ to 2+; probable allowed β feeding from (2-,3-).
4724.61 *23*			A	Jπ: γ′s to (4+) and (2+).
5009.4 *4*	(1-,2-,3-)		A	Jπ: γ to 2+; probable allowed β feeding from (2-,3-).

γ(^{40}S)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†
903.69	2+	0	0+	903.68 *9*	100
1916.84	(4+)	903.69	2+	1013.17 *20*	100
2254.79	(2+)	903.69	2+	1351.10 *14*	100 *7*
		0	0+	2254.5 *9*	1.6 *16*
3236.1		2254.79	(2+)	981.2 *4*	100
3489.46	(1,2+)	903.69	2+	2585.6 *4*	12.9 *24*
		0	0+	3489.6 *4*	100 *10*
3947.0		2254.79	(2+)	1692.6 *9*	25 *9*
		903.69	2+	3043.2 *4*	100 *11*
4138.30	(1-,2-,3-)	3489.46	(1,2+)	648.82 *15*	13.7 *12*
		903.69	2+	3234.7 *4*	100 *7*
4724.61		2254.79	(2+)	2469.79 *20*	100 *14*
		1916.84	(4+)	2808.2 *9*	86 *24*
5009.4	(1-,2-,3-)	3236.1		1773.2 *7*	8.5 *24*
		903.69	2+	4105.7 *4*	100 *14*

† From ^{40}P β^- decay.

^{40}P β^- decay (150 ms) 2001Wi21

Parent: ^{40}P: E=0.0; Jπ=(2-,3-); $T_{1/2}$=150 ms *8*; Q=14.76$\times10^3$ *20*; %β-=100

^{40}P was produced in the fragmentation of ^{48}Ca beam at E=70 MeV/nucleon with a Be target followed by analysis using using A1200 fragment separator. The decays of the implanted ions were studied by two Ge detectors and one thin plastic scintillator. Measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$ coin, $\beta\gamma\gamma$ coin.

Others: 2003Gr22, 1989Le16: measured $T_{1/2}$.

^{40}S Levels

E(level)	Jπ†	Comments
0.0	0+	
903.69 *7*	2+	
1916.84 *21*	(4+)	
2254.79 *12*	(2+)	
3236.1 *3*		
3489.46 *18*	(1,2+)	
3947.0 *3*		
4138.30 *20*	(1-,2-,3-)‡	
4724.61 *23*		Jπ: suggested (2001Wi21) as possible member of 3-phonon triplet since the level decays to members of 2-phonon triplet.
5009.4 *4*	(1-,2-,3-)‡	

† From Adopted Levels.
‡ 2001Wi21 suggest Jπ not 1-, since no g.s. transition observed.

γ(^{40}S)

The following γ' rays are assigned to ^{39}S from β-n decay of ^{40}P: 339.88 *11* (4.6 *5*), 398.61 *14* (6.1 *9*), 465.45 *19* (4.5 *9*).

Eγ	E_i^{level}	J_i^π	E_f^{level}	J_f^π	Iγ†
648.82 *15*	4138.30	(1-,2-,3-)	3489.46	(1,2+)	5.7 *5*
834.90 *8*	Unplaced				5.7 *17*
903.68 *9*	903.69	2+	0.0	0+	100 *2*
981.2 *4*	3236.1		2254.79	(2+)	2.5 *4*
1013.17 *20*	1916.84	(4+)	903.69	2+	5.2 *12*
1351.10 *14*	2254.79	(2+)	903.69	2+	12.5 *9*
1692.6 *9*	3947.0		2254.79	(2+)	1.1 *4*
1773.2 *7*	5009.4	(1-,2-,3-)	3236.1		1.4 *4*
2254.5 *9*	2254.79	(2+)	0.0	0+	0.2 *3*
2469.79 *20*	4724.61		2254.79	(2+)	6.4 *9*
2550.4 *5*	Unplaced				1.7 *4*
2585.6 *4*	3489.46	(1,2+)	903.69	2+	3.2 *6*
2614.8 *3*	Unplaced				2.6 *9*
2808.2 *9*	4724.61		1916.84	(4+)	5.5 *15*
3043.2 *4*	3947.0		903.69	2+	4.4 *5*
3234.7 *4*	4138.30	(1-,2-,3-)	903.69	2+	41.5 *29*
3489.6 *4*	3489.46	(1,2+)	0.0	0+	24.9 *24*
4105.7 *4*	5009.4	(1-,2-,3-)	903.69	2+	16.5 *23*

† For absolute intensity per 100 decays, multiply by 0.63 *3*

β^- radiations

Eβ^-	E(level)	Iβ^-†	Log *ft*‡	Comments
(9750.6)	5009.4	11.3 *16*	5.3	av Eβ=4589 *89*.
(10035.4)	4724.61	7.5 *12*	5.6	av Eβ=4730 *89*.

Continued on next page (footnotes at end of table)

β^- radiations (continued)

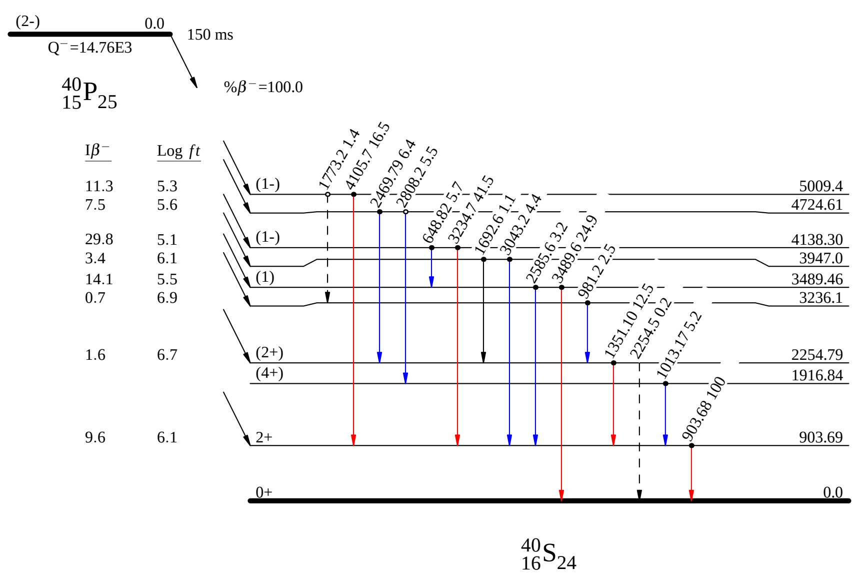
Eβ^-	E(level)	I$\beta^{-\dagger}$	Log *ft*‡	Comments
(10621.7)	4138.30	29.8 *26*	5.1	av Eβ=5019 *89*.
(10813.0)	3947.0	3.4 *5*	6.1	av Eβ=5113 *89*.
(11270.5)	3489.46	14.1 *18*	5.5	av Eβ=5338 *89*.
(11523.9)	3236.1	0.7 *3*	6.9	av Eβ=5463 *89*.
(12505.21)	2254.79	1.6 *9*	6.7	av Eβ=5946 *89*.
(13856.31)	903.69	9.6 *27*	6.1	av Eβ=6611 *89*.

† 6% *5* feeding remains unaccounted for. J(^{40}P g.s.)=2,3 does not allow significant feeding to ^{40}S g.s. This feeding may go to higher unobserved levels, although, no escape peaks are observed by 2001Wi21 for γ rays above 4.2 MeV. All β^- feedings should be considered as upper limits due to a large energy window available between the reported level at 5009 and Q value of 14510.

‡ These values should be considered as lower limits since some some of the decay strength may be shifted to higher (unobserved) states.

Decay Scheme

Intensities: I$_{(\gamma+ce)}$ per 100 parent decays



^{41}P β^-n decay (150 ms) 1989Le16,1998WiZV

Parent: ^{41}P: E=0; $T_{1/2}$=150 ms *15*; Q=9.52×10^3 *26*; %β^-n=30 *10*
%β^-n=30 *10* (1999YoZW).
No details are available about the level scheme.

^{9}Be(^{48}Ca,Xγ) 2002So14

2002So14 (also 2002Az02,2002Az01,2002Gu08,2000So17,2000Az03): ^{9}Be(^{48}Ca,X) E=2880 MeV. Measured Eγ, Iγ, $\gamma(\theta)$ using Clover Ge and BaF_2 detectors. FWHM≈35 keV at 1550 keV γ-ray energy.
A level at 3265 decaying by 2360γ (Iγ=20) was listed in conference papers (2002Az01,2002Gu08), but it is not included in 2002So14.

^{40}S Levels

E(level)	J$^\pi$	Comments
0	0+	
909 *5*	2+	
2265 *11*	(4+)	Jπ: $\gamma(\theta)$ allows 2+ and 4+; but fragmentation reaction used by 2002So14 favors yrast states.

γ(^{40}S)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ	Iγ	Mult.†	Comments
909	2+	0	0+	909 *5*	100	Q	
2265	(4+)	909	2+	1356 *6*	40	(Q)	Mult.: $\gamma(\theta)$ allows ΔJ=2, Q or ΔJ=0, D+Q.

† From $\gamma\gamma(\theta)$.

^{40}S(p,p′) 1999Ma63

Beam=^{40}S from fragmentation of ^{48}Ca beam with a Be target. Target=CH_2.
1999Ma63 (also 1999Su05,2000Bl25): E(^{40}S)=30 MeV/nucleon. Measured scattered ^{40}S (from protons in CH_2 target) using ΔE-E phoswich detectors and time-of-flight method. Measured $\sigma(\theta)$ for elastic and inelastic scattering (from first 2+ state) compared with DWBA calculations.

^{40}S Levels

E(level)	J$^\pi$	Comments
0	0+	
860 *90*	2+	β_2=0.35 *5*.

Coulomb excitation 1996Sc31

1996Sc31: ^{197}Au(^{40}S,^{40}S′γ) E=1.6 GeV. Measured Eγ.

^{40}S Levels

E(level)	Jπ	$T_{1/2}$	Comments
0	0+		
891 *13*	2+	15.9 ps *21*	B(E2)=0.0334 *36*. β_2=0.284 *16*. $T_{1/2}$: from B(E2).

γ(^{40}S)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ
891	2+	0	0+	891 *13*

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

Adopted Levels, Gammas

Q(β^-)=7480 *30*; S(n)=5830 *30*; S(p)=11680 *60*; Q(α)=-9730 *30* 2003Au03

^{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.

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.

1989Mi03: mass excess determination from βγ data.

1988Ma53: ^{40}Ar(n,p): analyzed one-nucleon transfer σ data, deduced g.s. occupation numbers for ^{40}Ar.

1997Fo01: ^{208}Pb(^{37}Cl,X) E=230 MeV: measured yield.

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)

Nuclear Level Sequence

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.

Seq.	E(level)†	Jπ#	$T_{1/2}$‡	XREF	Comments
A	0	2-	1.35 min *2*	ABC	%β-=100 . Jπ: log *ft*=5.0 to 1-; log *ft*=5.9 to 3-. $T_{1/2}$: 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-)		ABc	
A	244.03 *8*	(3-)	<10 ns	Bc	
	367.1 *4*	(2)		B	
	431.8 *3*	(0- to 3+)		AB	Jπ: γ to 2-; γ from 1+.

Continued on next page (footnotes at end of table)

^{40}Cl Levels (continued)

Seq.	E(level)†	Jπ#	$T_{1/2}$‡	XREF	Comments
A	601.28 *14*	(4-)	<7 ns	Bc	
	680.95 *17*	(4-)		Bc	
A	839.16 *15*	(5-)		BC	
	889.5 *4*	1+		A	Jπ: log *ft*=4.7 from 0+.
	1160 *40*			C	
	1293.3 *5*	(0-,1,2)		A	Jπ: γ's to 2-, 1+ and (1-).
	1580 *40*			C	
	1740 *40*			C	
A	2014.7 *4*	(6-)	≤3.5 ps	BC	
	2194.2 *3*	(5)		B	
	2307.2 *7*	1+		A C	Jπ: log *ft*=3.7 from 0+.
	2413.7 *4*	(6)		B	
A	2620.4 *5*	(7-)	≤3.5 ps	B	
A	4087.1 *8*	(8-)		B	

† From least-squares fit to Eγ's.
‡ From (^{36}S,αpγ) for excited states.
# When no Jπ arguments are given, the assignments are based on γ(θ) data in (^{36}S,αpγ) and comparison of experimental level structure with shell-model calculations (particularly of 1989Wa09 and 1989Ji01).

γ(^{40}Cl)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ	Iγ	Comments
211.62	(1-)	0	2-	211.62 *13*	100	Eγ: weighted average from β^- decay and (^{36}S,αpγ).
244.03	(3-)	0	2-	244.04 *8*	100	
367.1	(2)	211.62	(1-)	155.5 *3*	100	
431.8	(0- to 3+)	0	2-	431.8 *3*	100	Eγ: from β^- decay.
601.28	(4-)	244.03	(3-)	357.36 *14*	100 *5*	
		0	2-	601.1 *3*	8.6 *12*	
680.95	(4-)	244.03	(3-)	436.86 *17*	100	
839.16	(5-)	680.95	(4-)	157.8 *3*	9.7 *6*	
		601.28	(4-)	237.93 *9*	100 *3*	
		244.03	(3-)	594.9 *4*	7.4 *16*	
889.5	1+	431.8	(0- to 3+)	457.8 *9*	16 *3*	
		211.62	(1-)	677.9 *7*	100 *5*	
		0	2-	889.2 *8*	66 *4*	
1293.3	(0-,1,2)	889.5	1+	403.8 *6*	43 *5*	
		211.62	(1-)	1081.6 *8*	100 *7*	
		0	2-	1293.1 *10*	75 *6*	
2014.7	(6-)	839.16	(5-)	1175.4 *3*	100	
2194.2	(5)	680.95	(4-)	1513.6 *4*	100 *33*	
		601.28	(4-)	1592.5 *4*	42 *8*	
2307.2	1+	1293.3	(0-,1,2)	1013.7 *7*	100 *8*	
		431.8	(0- to 3+)	1875.6 *9*	43 *3*	
2413.7	(6)	2194.2	(5)	219.52 *13*	100	
2620.4	(7-)	2014.7	(6-)	605.4 *6*	100 *30*	
		839.16	(5-)	1781.4 *5*	42 *15*	
4087.1	(8-)	2620.4	(7-)	1466.7 *6*	100	

^{40}S β^- decay (8.8 s) 1998WiZX,1998WiZV

Parent: ^{40}S: E=0; Jπ=0+; $T_{1/2}$=8.8 s *22*; Q=4.69×10^3 *14*; %β^-=100
1998WiZX,1998WiZV: measured Eγ, Iγ, $\gamma\gamma$.
1986Du07: measured Eγ, Iγ, $T_{1/2}$. Reported four γ rays at 211.6, 431.9, 677.5 and 888.6.

^{40}Cl Levels

E(level)†	Jπ‡	$T_{1/2}$
0	2-	1.35 min *2*
211.8 *5*	(1-)	
431.7 *5*	(0- to 3+)	
889.5 *5*	1+	
1293.4 *5*	(0-,1,2)	
2307.2 *7*	1+	

† From least-squares fit to Eγ's.
‡ From Adopted Levels.

γ(^{40}Cl)

Eγ	E_i^{level}	J_i^π	E_f^{level}	J_f^π	I_γ†	Comments
211.9 *5*	211.8	(1-)	0	2-	100 *3*	
403.8 *6*	1293.4	(0-,1,2)	889.5	1+	13.2 *14*	
431.8 *5*	431.7	(0- to 3+)	0	2-	44.2 *20*	Proposed (in 1990En08) from a 643 level, unplaced in 1986Du07.
457.8 *9*	889.5	1+	431.7	(0- to 3+)	8.3 *15*	
677.9 *7*	889.5	1+	211.8	(1-)	52.7 *25*	
889.2 *8*	889.5	1+	0	2-	34.7 *22*	
1013.7 *7*	2307.2	1+	1293.4	(0-,1,2)	65 *5*	
1081.6 *8*	1293.4	(0-,1,2)	211.8	(1-)	30.8 *21*	
1293.1 *10*	1293.4	(0-,1,2)	0	2-	23.2 *19*	
1875.6 *9*	2307.2	1+	431.7	(0- to 3+)	27.7 *18*	

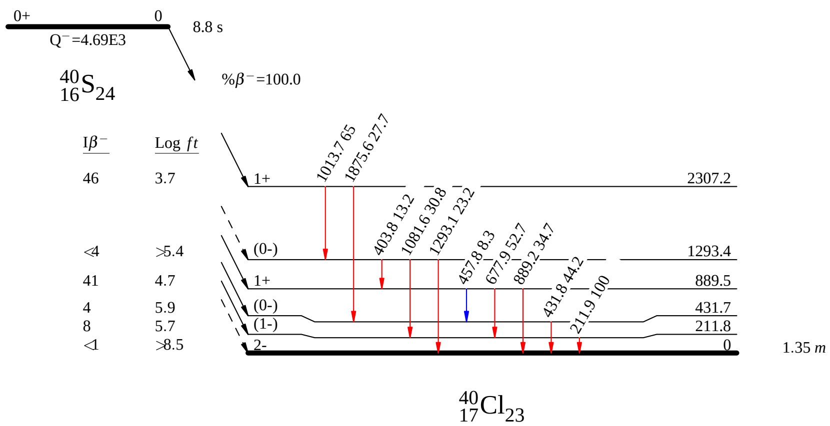
† For absolute intensity per 100 decays, multiply by 0.495 *10*.

β^- radiations

Eβ^-	E(level)	Iβ^-	Log *ft*	Comments
(2382.8)	2307.2	46 *3*	3.7 *2*	av Eβ=1008 *67*.
(3396.6)	1293.4	<4	>5.4	av Eβ=1494 *68*.
(3800.5)	889.5	41 *2*	4.7 *2*	av Eβ=1690 *68*.
(4258.3)	431.7	4 *2*	5.9 *3*	av Eβ=1913 *69*.
(4478.2)	211.8	8 *2*	5.7 *2*	av Eβ=2020 *69*.
(4690.00)	0	<1	>8.5	av Eβ=2136 *69*.

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{9}Be(^{36}S,αpγ) 1993Ba62,1988Ko05

1993Ba62: E=105 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma$(particle) coin.
1988Ko05: E=100 MeV. Measured Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma$, αpγ coin.
All data are from 1993Ba62, unless otherwise stated.

^{40}Cl Levels

900 level proposed by 1988Ko05 has been omitted due to the revised placement of 219.52γ by 1993Ba62.

Nuclear Level Sequence

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.

Seq.	E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$
A	0	2-	
	211.60 *13*	(1-)	
A	244.03 *8*	(3-)	<10 ns[#]
	367.1 *4*	(2)	
	431.63 *21*[&]		
A	601.28 *14*	(4-)	<7 ns[#]
	680.95 *17*	(4-)	
A	839.16 *15*	(5-)	
A	2014.7 *4*	(6-)	≤3.5 ps[@]
	2194.2 *3*	(5)	
	2413.7 *4*	(6)	
A	2620.4 *5*	(7-)	≤3.5 ps[@]
A	4087.1 *8*	(8-)	

[†] From least-squares fit to Eγ's.
[‡] For excited states, the assignments are based on $\gamma(\theta)$ data and comparison of experimental level structure with shell-model calculations (particularly of 1989Wa09 and 1989Ji01). All assignments are given here under parentheses, although, some were quoted without parentheses by 1993Ba62. All assignments are the same as in Adopted Levels.
[#] From electronic timing (1993Ba62).
[@] From estimate of Doppler shift attenuation (1993Ba62).
[&] Level population proposed (by the evaluators) based on ^{40}S β^- decay.

γ(^{40}Cl)

Asymmetry ratio R=yield at 135°/yield at 90° (1993Ba62).

E$_i^{level}$	J$_i^{\pi}$	E$_f^{level}$	J$_f^{\pi}$	Eγ	Iγ	Mult.	Comments
Unplaced				347			In coin with 244γ, 437γ and 220γ.
				676.7 *3*	3.2 *5*		R(135°/90°)=0.96 *30*. A 677.9γ is placed from an 888, 1+ level in β^- decay, but it seems unlikely that a 1+ level would be populated in (^{36}S,αpγ). Moreover a strong 889 transition from the same level seen in β^- decay is not reported in this reaction.
				2075	<0.6		
211.60	(1-)	0	2-	211.60 *13*[b]	11.0 *5*	(D)[c]	R(135°/90°)=0.99 *8*.
244.03	(3-)	0	2-	244.04 *8*[b]	100 *2*	(D)[c]	R(135°/90°)=0.96 *3*.
367.1	(2)	211.60	(1-)	155.5 *3*	0.4 *2*		
431.63		0	2-	431.63 *21*[ab]	10 *1*		R(135°/90°)=0.99 *10*. Placement proposed from a 643 level by 1990En08.

Continued on next page (footnotes at end of table)

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	$E\gamma$	$I\gamma$	Mult.	Comments
601.28	(4-)	244.03	(3-)	357.36 *14*[b]	43 *2*	(D)[c]	R(135°/90°)=0.94 *3*.
		0	2-	601.1 *3*[b]	3.7 *5*		
680.95	(4-)	244.03	(3-)	436.86 *17*[b]	26 *2*	(D)[c]	R(135°/90°)=0.87 *10*.
839.16	(5-)	680.95	(4-)	157.8 *3*	3.0 *2*	(D)[c]	R(135°/90°)=0.84 *17*.
		601.28	(4-)	237.93 *9*	31 *1*	(D)[c]	R(135°/90°)=0.83 *5*. Eγ: from 1988Ko05. Eγ=237.9 *2* (1993Ba62).
		244.03	(3-)	594.9 *4*	2.3 *5*		
2014.7	(6-)	839.16	(5-)	1175.4 *3*	7.1 *20*		
2194.2	(5)	680.95	(4-)	1513.6 *4*	6.0 *20*	(D)[c]	R(135°/90°)=0.7 *3*.
		601.28	(4-)	1592.5 *4*	2.5 *5*		
2413.7	(6)	2194.2	(5)	219.52 *13*[b]	9.0 *5*	(D)[c]	R(135°/90°)=0.67 *6*. This γ was placed from a 900 level by 1988Ko05
2620.4	(7-)	2014.7	(6-)	605.4 *6*	3.3 *10*		
		839.16	(5-)	1781.4 *5*	1.4 *5*		
4087.1	(8-)	2620.4	(7-)	1466.7 *6*	1.0 *7*		

[a] Placement proposed (by the evaluators) based on ^{40}S β^- decay.
[b] γ reported by 1988Ko05 also. Value given here is the weighted average from 1993Ba62 and 1988Ko05.
[c] $\gamma(\theta)$ data consistent with ΔJ=1, dipole.

$^{40}Ar(^7Li,^7Be),(^{11}B,^{11}C)$ **1984Fi02**

1984Fi02: $E(^7Li)$=52, 54; $E(^{11}B)$=81 MeV. Measured Q values and low-lying levels in ^{40}Cl. FWHM=180 keV for ^7Be spectra. Deduced mass excess for ^{40}Cl.

^{40}Cl Levels

E(level)	J^π[†]	Comments
0	2-[‡]	
230 *40*		
640 *30*	(4-)[‡]	Jπ: other: 5- (1984Fi02).
840 *30*	(5-)[‡]	Jπ: other: 3- (1984Fi02).
1160 *40*		Jπ: 4- (1984Fi02).
1580 *40*		
1740 *40*		
2020 *40*		
2290 *40*		

[†] From Adopted Levels.
[‡] 1984Fi02 suggest that low-lying levels of Jπ=2- to 5- may arise from weak coupling of 3/2+ ^{37}Cl g.s. to levels in ^{43}Ca, as in ^{38}Cl. The assignment is considered as tentative by the evaluators.

Adopted Levels, Gammas

Q(β^-)=-1504.69 *19*; S(n)=9869 *5*; S(p)=12528.7 *17*; Q(α)=-6800.74 *19* 2003Au03
Other reactions:.
Muonic x ray: $2p_{3/2}$ to $1s_{1/2}$: 643.674 keV *20* (1981Fr25, 1992Fr01), 643.94 keV *11* (1971Bb11,1976Pf01).
^{12}C(^{40}Ar,X) E=450 MeV/nucleon. Measured cross section.
^{40}Ar(X,X) E=5.9 keV: 1990Va11.
^{40}Ar(μ^-,X) E=125 MeV: 1999Ma14, measured capture rates.
^{40}Ar(π,π) E=180 MeV, measured $\sigma(\theta)$: 1986Ge01, 1985Ge04.
^{40}Ar(^{16}O,^{16}O) E=100 MeV: 1985Sh06, measured $\sigma(\theta)$.
^{40}Ar(^{16}O,^{16}O$'$) E=250 MeV/nucleon: 1996Ri19, 1996Ri09: deduced structure near isovector dipole and isoscalar quadrupole giant resonances.
^{40}Ar(^{32}S,^{32}S) E=100 MeV: 1989Al15, measured $\sigma(\theta)$.
^{40}Ca(e,π^+) E=400 MeV: 1983To18.
^{40}Ca(π^-,π^+) E=295 MeV: 1992Wa11, 1991Mo05: deduced double isovector giant-dipole resonance at 31.1 MeV with a Γ of 9.0 MeV. Others: 1989Gr06: E=180, 240 MeV; 1979Da16: E=290 MeV.
^{36}S(α,α): 1994An39: resonances were observed at Eα=13320 (Jπ=7-) and Eα=14120 (Jπ=8+).
Hyperfine structure and isotope shift measurements: 2003Sa20, 1996Kl04, 1988Mo30, 1986Mu06, 1982Ei01.
Mass measurement: 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	^{40}Ar(e,e$'$)	Q	^{40}Ca(^{14}C,^{14}O)
B	^{40}K ε decay (1.248×10^9 y)	J	^{40}Ar(n,n$'\gamma$)	R	^{41}K(d,^{3}He)
C	^{26}Mg(^{16}O,2pγ),^{27}Al(^{18}O,p$\alpha\gamma$)	K	^{40}Ar(p,p$'\gamma$)	S	^{42}Ca(^{14}C,^{16}O)
D	^{36}S(α,γ):resonances	L	^{40}Ar(p,p$'$),(pol p,p$'$)	T	^{44}Ca(^{3}He,^{7}Be)
E	^{37}Cl(α,pγ)	M	^{40}Ar(pol d,d$'$),(d,d$'$)	U	^{44}Ca(α,2α)
F	^{38}Ar(t,p)	N	^{40}Ar(^{3}He,^{3}He$'$)		
G	^{38}Ar(α,^{2}He)	O	^{40}Ar(α,α')		
H	^{40}Ar(γ,γ'),(pol γ,γ')	P	Coulomb excitation		

E(level)	J$^{\pi\dagger}$	T or $\Gamma^\ddagger$	XREF	Comments
0	0+	STABLE	ABCDEFGHIJKLMNOPQRSTU	Δ<r^2>(^{38}Ar-^{40}Ar)=0.169 fm^2 *33* (1996Kl04), 0.17 fm^2 (1986Mu06). From Muonic x-ray data: <r^2>$_{1/2}$=3.415 fm *5* (1976Pf01), 3.429 fm *6* (1971Bb11). Jπ: optical spectroscopy measurements: 1937Ko03, 1953Me73; no hyperfine structure seen.
1460.851 *6*	2+	1.12 ps *4*	ABCDEFGHIJKLMNOPQRSTU	μ=-0.2 *2* (1992Cu04). Q=+0.01 *4* (1989Ra17,1970Na05). Jπ: L(α,α')=L(t,p)=L(pol d,d$'$)=L(pol p,p$'$)=2. μ: transient-field integral PAC. Q: reorientation in Coul. ex. (1970Na05).
2120.8 *3*	0+	90 ps *28*	A DE JKLM O TU	Jπ: L(α,α')=L(p,p$'$)=0.
2524.1 *2*	2+	0.220 ps *20*	A DEF IJKLM O R T	Jπ: L(α,α')=L(pol d,d$'$)=L(pol p,p$'$)=2.
2892.60 *11*	4+	2.4 ps *5*	A CDEFG KLM O T	Jπ: L(α,α')=L(pol d,d$'$)=L(pol p,p$'$)=4.
3208.0 *6*	2+	38 fs *10*	A DEF IJKLM O RST	Jπ: L(t,p)=L(pol p,p$'$)=2.
3464.48 *13*	6+	0.680 ns *20*	C EFG O	Jπ: $\gamma(\theta$,pol) in (^{16}O,2pγ).
3511.3 *5*	2+	58 fs *9*	A DEF I KLM o R T	Jπ: L(pol d,d$'$)=2.
3515 *1*	4+	0.14 ps *3*	EF o	Jπ: $\gamma(\theta$,pol) in (α,pγ).
3680.8 *2*	3-	0.124 ps *24*	A DE I KLM O T	Jπ: L(α,α')=L(pol d,d$'$)=L(pol p,p$'$)=3.
3918.8 *2*	2+	0.28 ps *3*	A DEF I KLm o	Jπ: L(t,p)=2.
3941.7 *3*			A m o u	Jπ: (1,2+) from possible γ to g.s.
4041 *1*	NATURAL	<21 ns	DEF KL O u	Jπ: 0+, 1-, 2+, 3-, 4+ from γ to 2+ and π=n in (α,α'). Ref: L: 4053.
4082.5 *2*	3-	40 fs *14*	A DEF KL O u	Jπ: $\gamma(\theta$,pol) in (p,p$'\gamma$) and (α,pγ).
4178.9 *3*			A	

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^{40}Ar Levels (continued)

E(level)	J$^{\pi}$†	T or Γ‡	XREF	Comments
4226 *1*	4-	>2.8 ps	E K	Jπ: γ(θ,pol) in (α,pγ); RUL.
4229 *1*	(1+,2-,3+)	0.17 ps *3*	E KL O	Jπ: unnatural parity from (α,α′); γ to 2+. Ref: L: 4240. Ref: O: 4229.
4300.8 *3*	(1,3)-	58 fs *14*	A DE L O s	Jπ: log *ft*=5.1 from 2-; natural parity in (α,α′).
4324.5 *3*	2+	17 fs *5*	A DEf O Rs	Jπ: L(d,^{3}He)=0; L(t,p)=2. Ref: R: 4360.
4358.0 *3*	NATURAL		A L O s	Jπ: from (α,α′); possible γ to g.s. Ref: α: ?.
4420 *1*	(0+ to 4+)	<21 ns	E KlM o	Jπ: γ to 2+; natural parity in (α,α′) for 4420 and/or 4427 gives 1-,2+,3-,4+.
4427 *1*	(4+)	0.125 ps *20*	EF l o	Jπ: L(t,p)=3,4; γ(θ,pol) in (α,pγ) gives (3,4,5)+.
4473 *1*	1#	0.070 eV *13*	DE H	
4481.0 *3*	1-	<0.07 ps	A KL O	Jπ: γ(θ) in (p,p′γ); natural parity in (α,α′). Ref: α: ?.
4494 *1*	5-	0.50 ps *7*	E	Jπ: γ(θ,pol) in (α,pγ).
4562.3 *2*	(1,3)-		A E O R	Jπ: log *ft*=5.4 from 2-; natural parity in (α,α′). Ref: R: 4530.
4578 *1*	(2+,3-)	37 fs *14*	A E L O	Jπ: γ(θ) in (α,pγ); natural parity in (α,α′). Ref: α: ?.
4602 *1*	(0+ to 4+)	50 fs *20*	DE L O	Jπ: γ to 2+. Ref: O: 4612.
4674 *1*	(1+,2-,3+)	66 fs *17*	E L O s	Jπ: γ to 2+; π=unnatural in (α,α′). Ref: O: 4683.
4737.8 *4*			A s	Jπ: possible γ to g.s.
4769.0 *3*	1-#	0.82 eV *6*	A E H L O	Jπ: π=natural in (α,α′); γ to g.s.
4794 *1*	4+	52 fs *14*	EF L O	Jπ: (3,4)+ from γ(θ,pol) in (α,pγ); L(t,p)=3,4. Ref: O: 4808.
4858 *1*	5-	37 fs *10*	E	Jπ: γ(θ,pol).
4875 *9*	3-		F LM O	Jπ: L(pol d,d′)=3; L(t,p)=3,4.
4901 *3*			H	Jπ: (1,2+) from possible γ to g.s.
4929 *1*	(1- to 4+)		E	Jπ: γ′s to 2+ and 3-.
4942.6 *4*			A L o	
4959 *1*	(6)+	0.10 ps *4*	Ef o	Jπ: γ(θ,pol) in (α,pγ); natural parity in (α,α′) for either 4943 and/or 4959 level. Jπ=(4+,5+) from (α,pγ) are less likely but not ruled out.
4972 *1*	(2+,3,4+)		Ef	Jπ: γ′s to 2+ and 4+.
4991 *1*	4-	2.1 ps *7*	E L O	Jπ: γ(θ,pol); natural parity in (α,α′). Ref: O: 5004.
5110 *3*			H	Jπ: possible γ to 0+.
5115 *2*			EF	Jπ: L=(5) in (t,p).
5143 *2*	(5)	<10 fs	E	Jπ: γ′s to 4+ and 6+; RUL disfavors E2.
5165.8 *8*	(2,3,4)+		A E O R	Jπ: L(d,^{3}He)=0; γ′s to 2+ and 4+; natural parity in (α,α′) favors (2,4)+. Ref: R: 5200.
5191			F	
5245 *2*	(0+ to 4+)		E	Jπ: γ to 2+.
5270.1 *4*	(1-,2+,3-,4+)		A E l O s	Jπ: γ′s to 2+ and 3-; natural parity in (α,α′).
5293 *2*			Ef l s	Jπ: γ to 2+.
5310 *2*	NATURAL		A Ef l O s	Jπ: from (α,α′); γ to 3-. Ref: α: ?.
5350 *2*			E s	Jπ: γ to 4+.
5378 *2*	(4+,5,6+)		E	Jπ: γ′s to 4+ and 6+.
5400.5 *8*	1-#	0.030 eV *7*	A F H L O	Jπ: natural parity in (α,α′).

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^{40}Ar Levels (continued)

E(level)	J$^{\pi\dagger}$	T or $\Gamma^{\ddagger}$	XREF	Comments
5454 *15*	3-,4+		F L O	Jπ: L(t,p)=3,4.
5508 *2*	NATURAL		EF O	Jπ: from (α,α'); γ to 4+.
5544 *2*	(0+ to 4+)		E	Jπ: γ to 2+.
5559 *2*	(4+,5-,6+)		E O	Jπ: γ's to 4+ and 6+; natural parity in (α,α'). Ref: O: 5575.
5608.7 *10*	(1,2,3)		A E o	Jπ: γ to 2+; log *ft*=6.0 from 2-; (natural) parity in (α,α') for a group near 5608.
5611 *2*			E o	Jπ: γ to 6+.
5630 *1*			A E o	Jπ: (natural) parity from (α,α') for a doublet; γ to (4+). Ref: α: ?.
5654 *2*			E	Jπ: γ to 2+.
5662 *2*			E l	Jπ: γ to 4+.
5675 *2*	(3-,4+)		EF l O	Jπ: L(t,p)=3,4; natural parity in (α,α').
5717.8 *10*			A l O u	
5766 *2*			E u	Jπ: γ to 2+.
5818 *2*			EF R u	Jπ: L(t,p)=(3,4); γ to 4+.
5880.4 *8*	1-#	0.117 eV *13*	A E H m o	Jπ: γ's to 0+ and 2+.
5885 *2*	3-		A EF Lm o	Jπ: L(pol p,p′)=3; L(pol d,d′)=(3). But L(t,p)=2 is inconsistent.
5905.9 *7*	(1-)		A O	Jπ: γ to 0+; log *ft*=5.8 from 2-; natural parity in (α,α').
5912 *3*	1#	0.050 eV *17*	H	
5913 *2*	(1- to 4+)		E	Jπ: γ's to 2+ and 3-.
5931 *2*	(2+,3,4+)		E	Jπ: γ's to 2+ and 4+.
5950.5 *10*	(1,2)		A O	Jπ: γ to 0+.
5973 *2*			E	Jπ: γ to 6+.
6013 *2*	(4+ to 7-)		E	Jπ: γ's to 6+ and 5-.
6053.6 *8*	1#	0.41 eV *6*	A H o	
6054	4+		M o	Jπ: L(pol d,d′)=4; natural parity in (α,α').
6100 *2*	(1,2+)#		E H	Γ_0=0.22 eV *6* for J(6100)=1; 0.13 eV *4* for J(6100)=2.
6104 *2*			E	Jπ: γ to 4+.
6138 *2*			A EF L O	E(level): doublet: 6133+6138. Jπ: γ to 6+; but L=(2,3) in (p,p′). Ref: α: ?.
6158 *2*	(4+,5,6+)		E	Jπ: γ's to 4+ and 6+.
6185 *2*			E	Jπ: γ to 5-.
6203 *2*			E o R	Jπ: γ to 4+; natural parity for a 6208 group in (α,α'). E(level): doublet: 6203+6208. Ref: R: 6230.
6208.5 *8*	(1,2)		A o	Jπ: γ to 0+.
6270 *2*			E l	Jπ: γ to 6+.
6276.0 *9*	(1-,2-,3-)		A l	Jπ: log *ft*=5.6 from 2-.
6305 *2*	(4+,5,6+)		EF l	Jπ: γ's to 4+ and 6+.
6338.7 *11*	1(-)#	0.29 eV *3*	A H	Jπ: log *ft*=5.6 from 2-.
6356 *2*	(4+ to 7-)		E	Jπ: γ's to 5- and 6+.
6450 *3*			H	
6476.0 *8*	1(-)	0.43 eV *5*	A F H L	Jπ: $\gamma(\theta)$ in (γ,γ'); log *ft*=5.6 from 2-. L(t,p)=2 is inconsistent.
6651.7 *8*			A F L	Ref: α: ?.
6703 *3*	1#		H	
6760 *15*	3-,4+		F	Jπ: L(t,p)=3,4.
6806 *2*	(8+)		E	Jπ: γ to (6+); possible analog state of ^{42}Ca (1983Bi08).
6835 *15*	3-,4+		F	Jπ: L(t,p)=3,4.
6979 *2*	(8-)		E	Jπ: γ to (6-); possible analog state of ^{42}Ca (1983Bi08).

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^{40}Ar Levels (continued)

E(level)	Jπ[†]	T or Γ[‡]	XREF	Comments
7070 *15*			F	
7168 *3*	1[#]		F H	
7246 *3*	1[#]		H	
7281 *3*	1[#]		F H L	
7519 *3*	1[#]		F H	
7626 *3*	1[#]		H	
7640 *15*	2+		F	Jπ: L(t,p)=2.
7708 *3*	1[#]		H	
7730 *3*			F	
7918 *2*	1[#]		F H	Ref: F: 7890.
7993 *3*	1[#]		F H	
8032 *3*	1,2+[#]		H	
8162 *3*	1-		H	Jπ: $\gamma(\theta$,pol).
8191 *3*	1[#]		H	
8303 *3*	1[#]		H	
8552 *3*	1[#]		H	
8585 *3*	1[#]		H	
8644 *3*	1[#]		H	
8676 *3*	1,2+[#]		H	
8883 *3*	1[#]		H	
8918 *3*	1-[#@]	0.34 eV *14*	D H	
9127 *3*	1-[#@]	0.71 eV *14*	D H	
9138 *6*	(1-,2+)[@]		D	
9147 *5*	1-[@]		D	
9178 *3*	1-[@]		D	
9197 *6*	(1-,2+)[@]		D	
9216 *4*	1-[@]		D	
9234 *4*	1-[@]		D	
9240 *6*	1-[@]		D	
9264 *4*	(1-,2+)[@]		D	
9273 *6*	1-[@]		D	
9287 *4*			D	
9296 *5*	(1-,2+)[@]		D	
9314 *4*	(1-,2+)[@]		D	
9330 *4*	1-[@]		D	
9337 *3*	1-[@]		D H	
9355 *3*	1-[#@]	1.0 eV *3*	D H	
9373 *4*			D	
9412 *4*	1-[#@]	3.4 eV *18*	D H	E(level): doublet: 9408+9417 in (α,γ) with same Jπ for both; the second component seems to correspond to 9416 in (γ,γ').
9425 *5*	(1-,2+)[@]		D	
9433 *5*	(1-,2+)[@]		D	
9449 *3*	1-[@]		D	
9472 *4*	(1-,2+)[@]		D	
9485 *5*	1-[@]		D	
9491			D	
9503 *2*	1-	7.9 eV *13*	D H	Jπ: $\gamma(\theta$,pol) in (γ,γ'); $\gamma(\theta)$ in (α,γ).
9527 *4*			D	
9565 *4*	1-[@]		D	
9583 *3*	1-[#@]	7.3 eV *21*	D H	E(level): doublet:9581+9586 in (α,γ); the second component has Jπ=(1-,2+).
9596 *4*			D	
9608 *5*			D	
9617 *3*	1-[@]		D	

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^{40}Ar Levels (continued)

E(level)	Jπ†	T or Γ‡	XREF	Comments
9656 *4*	1-@		D	
9669 *4*	1-@		D	
9690 *5*	(1-,2+)@		D	E(level): doublet:9687+9694 with the same Jπ for both.
9735 *3*	1-@		D	
9757 *3*	1(-)#@	0.56 eV *22*	D H	
9769 *4*	(1-,2+)@		D	
9787 *4*	1-@		D	
9813 *3*	1-@		D	
9824 *3*	1-@		D	
9840 *3*	1#		H	
9851 *2*	1-	21 eV *4*	D H	Jπ: γ(θ,pol) in (γ,γ′). E(level): doublet: 9849+9852 in (α,γ).
9866 *4*			D	
9881 *4*	1-@		D	
9893 *4*	1-@		D	
9912 *5*	(1-,2+)@		D	
9943 *3*	1-@		D	
9952 *3*	1(-)#	10 eV *3*	D H	Jπ: parity from (α,γ).
10090 *3*	1#		H	
10151 *3*	1#		H	
10180 *2*	1#		H	
10362 *3*	1,2+#		H	
10745 *3*	1#		H	
10857 *3*	1#		H	
17.7×10^3 *2*	2		O	E(level): isoscalar giant-quadrupole resonance with L(α,α′)=2.

† In (d,^{3}He) reaction, Jπ(target)=3/2+.
‡ Primarily from (α,pγ). Widths are from (γ,γ′) and/or (α,γ). Some lifetimes are also available from (p,p′γ) and (α,γ). Weighted averages taken when values are available from more than one reactions.
# γ(θ) in (γ,γ′).
@ γ(θ) in (α,γ).

γ(^{40}Ar)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ†	Iγ‡	Mult.§	δ§	Comments
1460.851	2+	0	0+	1460.822 *6*	100	E2		B(E2)(W.u.)=9.3 *4*.
2120.8	0+	1460.851	2+	660.1 *4*	100	[E2]		B(E2)(W.u.)=6.2 *20*.
2524.1	2+	1460.851	2+	1063.1 *2*	100 *2*	M1+E2	-0.33 *9*	B(E2)(W.u.)=13 *7*. B(M1)(W.u.)=0.043 *5*.
		0	0+	2524.1 *2*	75 *2*	[E2]		B(E2)(W.u.)=1.32 *13*.
2892.60	4+	2524.1	2+	369.0 *6*	1.0 *5*	[E2]		B(E2)(W.u.)=42 *23*.
		1460.851	2+	1431.76 *10*	100 *2*	E2		B(E2)(W.u.)=4.8 *10*.
3208.0	2+	2892.60	4+	315.0 *5*	1.0 *3*	[E2]		B(E2)(W.u.)=5.2×10^3 *21* is much higher than allowed by RUL.
		2120.8	0+	1087.6 *4*	2 *1*	[E2]		B(E2)(W.u.)=21 *12*.
		1460.851	2+	1746.5 *2*	100 *1*	M1+E2	+0.11 *7*	B(E2)(W.u.)=1.2 *12*. B(M1)(W.u.)=0.094 *25*.
		0	0+	3208.2 *3*	11 *1*	[E2]		B(E2)(W.u.)=0.52 *15*.
3464.48	6+	2892.60	4+	571.88 *8*	100	E2		B(E2)(W.u.)=1.67 *5*. Mult.: γ(θ,pol) in (^{16}O,2pγ).
3511.3	2+	3208.0	2+	303.0 *6*	2 *2*			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
		2892.60	4+	621.1 *6*	2 *2*	[E2]		B(E2)(W.u.)=2.0×10^2 *20*.
		2524.1	2+	987	6 *2*			
		1460.851	2+	2050.5 *4*	100 *2*	M1(+E2)	-0.05 *11*	B(M1)(W.u.)=0.035 *6*.
		0	0+	3511.0 *5*	17 *2*	[E2]		B(E2)(W.u.)=0.30 *6*.
3515	4+	2892.60	4+	622	52 *3*	M1(+E2)	-0.07 *10*	B(M1)(W.u.)=0.20 *5*.
		2524.1	2+	991	15 *5*	[E2]		B(E2)(W.u.)=47 *19*.
		1460.851	2+	2054	100 *3*	[E2]		B(E2)(W.u.)=8.1 *18*.
3680.8	3-	2892.60	4+	788.1 *3*	12 *1*	[E1]		B(E1)(W.u.)=0.00095 *21*.
		2524.1	2+	1156.2 *4*	5 *2*	[E1]		B(E1)(W.u.)=0.00013 *6*.
		1460.851	2+	2220.0 *2*	100 *2*	E1(+M2)	-0.07 *+5-11*	B(E1)(W.u.)=0.00035 *7*.
		0	0+	3681	<6			
3918.8	2+	3680.8	3-	239.0 *3*	0.8	[E1]		B(E1)(W.u.)=0.00072 *9*.
		2524.1	2+	1394.7 *3*	22 *3*			
		2120.8	0+	1797.8 *2*	15 *3*	[E2]		B(E2)(W.u.)=1.2 *3*.
		1460.851	2+	2457.7 *4*	30 *3*	M1+E2		B(E2)(W.u.)=0.25 *4*. B(M1)(W.u.)=0.00047 *8*. δ: <-0.3 or >+6.
		0	0+	3918.6 *2*	100 *5*	E2		B(E2)(W.u.)=0.160 *21*.
3941.7		0	0+	3941.7 *2*	100			
4041	NATURAL	2524.1	2+	1517	100 *22*			
		1460.851	2+	2580	67 *22*			
4082.5	3-	2524.1	2+	1558.7 *4*	3.1 *6*	[E1]		B(E1)(W.u.)=0.00011 *5*.
		1460.851	2+	2621.7 *2*	100 *1*	[E1]		B(E1)(W.u.)=0.0008 *3*.
		0	0+	4082.1 *8*	1.0 *3*	[E3]		B(E3)(W.u.)=1.6×10^2 *8*.
4178.9		0	0+	4178.7 *3*	100			
4226	4-	3680.8	3-	545	89 *4*	(M1+E2)	-10 *+3-9*	B(E2)(W.u.)=240 . B(M1)(W.u.)=0.00036 .
		2892.60	4+	1333	100 *4*	(E1(+M2))	+0.6 *+4-8*	B(E1)(W.u.)=4.6×10^{-5} . B(M2)(W.u.)=63 .
4229	(1+,2-,3+)	2524.1	2+	1705	100 *4*			
		1460.851	2+	2768	30 *4*			
4300.8	(1,3)-	3680.8	3-	621.1 *6*	<1			
		3208.0	2+	1092.9 *8*	2.1 *7*	[E1]		B(E1)(W.u.)=0.00015 *7*.
		2524.1	2+	1776.9 *8*	1.0 *4*	[E1]		B(E1)(W.u.)=1.7×10^{-5} *8*.
		1460.851	2+	2840.1 *3*	100 *1*	[E1]		B(E1)(W.u.)=0.00042 *11*.
4324.5	2+	1460.851	2+	2864	100 *7*			
		0	0+	4324.2 *3*	41 *7*	[E2]		B(E2)(W.u.)=0.8 *3*.
4358.0	NATURAL	0	0+	4357.6 *3*	100			
4420	(0+ to 4+)	3208.0	2+	1212	11 *2*			
		2524.1	2+	1896	10 *2*			
		1460.851	2+	2959	100 *4*			
4427	(4+)	2892.60	4+	1534	75 *9*	(M1+E2)		
		1460.851	2+	2966	100 *9*	[E2]		B(E2)(W.u.)=1.4 *3*.
4473	1	0	0+	4473	100			
4481.0	1-	0	0+	4480.7 *3*	100	(E1)		
4494	5-	3515	4+	979	15 *2*	[E1]		B(E1)(W.u.)=0.000115 *23*.
		3464.48	6+	1029	46 *3*	(E1(+M2))	+0.06 *+7-10*	B(E1)(W.u.)=0.00030 *5*.
		2892.60	4+	1601	100 *3*	E1(+M2)	0.00 *+6-9*	B(E1)(W.u.)=0.00018 *3*.
4562.3	(1,3)-	4300.8	(1,3)-	261.2 *7*	7 *2*			
		4082.5	3-	479.9 *4*	7.0 *14*			
		3918.8	2+	643.6 *3*	56 *8*			
		3680.8	3-	881.3 *3*	24 *6*			
		3511.3	2+	1051.1 *5*	4 *1*			
		3208.0	2+	1353.7 *5*	2 *1*			
		1460.851	2+	3101.7 *4*	100 *10*			
4578	(2+,3-)	4358.0	NATURAL	222.5 *5*				
		3511.3	2+	1067	90 *10*			
		3208.0	2+	1370	38 *5*			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[§]	δ[§]	Comments
		2892.60	4+	1685	100 *10*			
		1460.851	2+	3117	28 *5*			
		0	0+	4580.1 *5*				
4602	(0+ to 4+)	2524.1	2+	2078	100 *2*			
		1460.851	2+	3141	11 *2*			
4674	(1+,2-,3+)	1460.851	2+	3213	100			
4737.8		0	0+	4737.5 *4*				
4769.0	1-	0	0+	4768.7 *3*	100			
4794	4+	2892.60	4+	1901	100 *10*	M1+E2		B(E2)(W.u.)=13 *4*. B(M1)(W.u.)=0.015 *5*.
		1460.851	2+	3333	100 *10*	[E2]		B(E2)(W.u.)=1.6 *5*.
4858	5-	4494	5-	364	15 *8*			
		3464.48	6+	1394	36 *2*	[E1]		B(E1)(W.u.)=0.0014 *4*.
		2892.60	4+	1965	100 *3*	E1(+M2)	-0.09 *+8-12*	B(E1)(W.u.)=0.0014 *4*.
4901		0	0+	4901 *3*				
4929	(1- to 4+)	3680.8	3-	1248	100 *8*			
		2524.1	2+	2405	44 *6*			
		1460.851	2+	3468	56 *6*			
4942.6				361.3 *5*	90 *20*			
		4562.3	(1,3)-	381.0 *5*	100 *40*			
4959	(6)+	3515	4+	1444	100 *5*	E2		B(E2)(W.u.)=70 *30*.
		2892.60	4+	2066	56 *5*	E2		B(E2)(W.u.)=7 *3*.
4972	(2+,3,4+)	2892.60	4+	2079	100 *7*			
		1460.851	2+	3511	69 *7*			
4991	4-	4226	4-	765	100 *2*	(M1+E2)		
		4082.5	3-	909	11 *1*			
		3680.8	3-	1310	10 *1*			
5110		0	0+	5110 *3*				
5115		3464.48	6+	1651	100			
5143	(5)	3515	4+	1628	20 *2*			
		3464.48	6+	1678	100 *2*			
5165.8	(2,3,4)+	3515	4+	1650	100 *4*			
		1460.851	2+	3704.6 *8*	43 *4*			
		0	0+	5165.5 *10*	4 *2*			
5245	(0+ to 4+)	1460.851	2+	3784	100			
5270.1	(1-,2+,3-,4+)	4082.5	3-	1186.7 *4*	74 *22*			
		3680.8	3-	1589.0 *3*	100 *35*			
		3208.0	2+	2063.0 *10*	43 *26*			
5293		1460.851	2+	3832	100			
5310	NATURAL	4562.3	(1,3)-	748	23 *2*			
		4082.5	3-	1228	85 *6*			
		3680.8	3-	1629	100 *6*			
		0	0+	5309.6 *10*				
5350		2892.60	4+	2457	100			
5378	(4+,5,6+)	3515	4+	1863	42 *4*			
		3464.48	6+	1913	55 *4*			
		2892.60	4+	2485	100 *8*			
5400.5	1-	0	0+	5400.1 *8*	100			
5508	NATURAL	3515	4+	1993	100			
5544	(0+ to 4+)	1460.851	2+	4083	100			
5559	(4+,5-,6+)	3515	4+	2044	46 *4*			
		3464.48	6+	2094	61 *4*			
		2892.60	4+	2666	100 *7*			
5608.7	(1,2,3)	1460.851	2+	4147.7 *10*	100			
5611		3464.48	6+	2147	100			
5630		4427	(4+)	1203	100			
		0	0+	5629.0 *10*				
5654		2524.1	2+	3130	100			
5662		2892.60	4+	2769	100			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	$E\gamma$[†]	$I\gamma$[‡]	Mult.[§]	δ[§]	Comments
5675	(3-,4+)	3680.8	3-	1994	100			
5717.8		2524.1	2+	3193.7 *10*	100			
5766		3208.0	2+	2558	100			
5818		2892.60	4+	2925	100			
5880.4	1-	4562.3	(1,3)-	1317.2 *5*	10 *3*			
		4300.8	(1,3)-	1579.9 *8*	8 *3*			
		2524.1	2+	3356.6 *8*	8 *3*			
		2120.8	0+	3759.9 *10*	2.6 *13*			
		0	0+	5879.6 *12*	100 *5*			
5885	3-	2892.60	4+	2992	100 *7*			
		1460.851	2+	4424	87 *7*			
5905.9	(1-)	2120.8	0+	3784.9 *6*	100			
5912	1	0	0+	5912 *3*	100	D		
5913	(1- to 4+)	4082.5	3-	1830	100 *10*			
		3208.0	2+	2704	100 *10*			
5931	(2+,3,4+)	2892.60	4+	3038	100 *6*			
		1460.851	2+	4470	39 *6*			
5950.5	(1,2)	0	0+	5950.0 *10*	100			
5973		3464.48	6+	2508	100			
6013	(4+ to 7-)	4494	5-	1519	100 *6*			
		3464.48	6+	2548	100 *6*			
6053.6	1	0	0+	6053.1 *8*	100			
6100	(1,2+)	1460.851	2+	4639	100 *7*			
		0	0+	6100	33 *7*			
6104		2892.60	4+	3211	100			
6138		3464.48	6+	2674	100			
6158	(4+,5,6+)	3464.48	6+	2693	100 *2*			
		2892.60	4+	3265	15 *2*			
6185		4494	5-	1691	100			
6203		2892.60	4+	3310	100			
6208.5	(1,2)	0	0+	6208.0 *8*	100			
6270		3464.48	6+	2805	100			
6276.0	(1-,2-,3-)	4942.6		1333.4 *8*	100			
6305	(4+,5,6+)	3515	4+	2790	100 *8*			
		3464.48	6+	2840	67 *8*			
6338.7	1(-)	0	0+	6338.2 *11*	100			
6356	(4+ to 7-)	4858	5-	1498	100 *7*			
		3464.48	6+	2891	49 *7*			
6450		0	0+	6450 *3*				
6476.0	1(-)	0	0+	6475.5 *8*	100			
6651.7		5608.7	(1,2,3)	1042.3 *3*	100			
6703	1	0	0+	6703 *3*	100			
6806	(8+)	4959	(6)+	1847	100			
6979	(8-)	5973		1006	100			
7168	1	0	0+	7168 *3*	100			
7246	1	0	0+	7246 *3*	100			
7281	1	0	0+	7281 *3*	100			
7519	1	0	0+	7519 *3*	100			
7626	1			6168 *3*				
		0	0+	7626 *3*	100			
7708	1	0	0+	7708 *3*	100			
7918	1	0	0+	7918 *2*	100			
7993	1	0	0+	7993 *3*	100			
8032	1,2+	1460.851	2+	6570 *3*				
		0	0+	8032 *3*	100			
8162	1-	1460.851	2+	6703 *2*				
		0	0+	8162 *2*	100	E1		
8191	1	0	0+	8191 *3*	100			
8303	1	0	0+	8303 *3*	100			

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	$E\gamma$†	$I\gamma$‡	Mult.§	δ§	Comments
8552	1	0	0+	8552 *3*	100			
8585	1	0	0+	8585 *3*	100			
8644	1	0	0+	8644 *3*	100			
8676	1,2+	0	0+	8676 *3*	100			
8883	1	0	0+	8883 *3*	100			
8918	1-	0	0+	8918 *3*	100			
9127	1-	0	0+	9127 *3*	100			
9337	1-	0	0+	9337 *3*	100			
9355	1-	4300.8	(1,3)-	5054	7			
		3918.8	2+	5436	8			
		0	0+	9356 *3*	100			
9412	1-	4082.5	3-	5331	54			
		3918.8	2+	5494	40			
		3511.3	2+	5902	51			
		2524.1	2+	6889	8.6			
		1460.851	2+	7952	31			
				9416 *3*	100			
9449	1-	3511.3	2+	5938	23			
		3208.0	2+	6241	23			
		2892.60	4+	6556	11			
		2524.1	2+	6925	37			
		2120.8	0+	7328	34			
		1460.851	2+	7988	100			
		0	0+	9449	69			
9503	1-	3918.8	2+	5586	3			
		2120.8	0+	7383	2			
		1460.851	2+	8043	7			
		0	0+	9503	100			
9583	1-	3918.8	2+	5664	12			
		2892.60	4+	6690	12			
		2524.1	2+	7059	27			
		2120.8	0+	7462	61			
		1460.851	2+	8122	44			
		0	0+	9582 *3*	100			
9617	1-	3918.8	2+	5699	11			
		3680.8	3-	5936	4			
		3511.3	2+	6106	4			
		3208.0	2+	6409	9			
		2892.60	4+	6724	3			
		2524.1	2+	7093	15			
		2120.8	0+	7496	7			
		1460.851	2+	8156	100			
		0	0+	9617	67			
9690	(1-,2+)	4602	(0+ to 4+)	5088	26			
		4324.5	2+	5365	15			
		3918.8	2+	5771	11			
		3511.3	2+	6175	11			
		3208.0	2+	6482	9			
		2524.1	2+	7166	100			
		1460.851	2+	8229	7			
		0	0+	9690	6			
9735	1-	4602	(0+ to 4+)	5133	10			
		3918.8	2+	5816	27			
		3208.0	2+	6527	23			
		2524.1	2+	7211	10			
		2120.8	0+	7614	15			
		1460.851	2+	8274	23			
		0	0+	9735	100			
9757	1(-)	0	0+	9757 *3*	100			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
9824	1-	3918.8	2+	5905	40			
		3680.8	3-	6143	36			
		3511.3	2+	6313	8			
		3208.0	2+	6616	52			
		2524.1	2+	7300	68			
		2120.8	0+	7703	28			
		1460.851	2+	8363	100			
		0	0+	9824	68			
9840	1	0	0+	9840 *3*	100			
9851	1-	2892.60	4+	6957	19			
		2524.1	2+	7326	60			
		1460.851	2+	8389	53			
		0	0+	9850 *2*	100	E1		
9943	1-	3918.8	2+	6024	13			
		2524.1	2+	7419	61			
		2120.8	0+	7822	24			
		1460.851	2+	8482	66			
		0	0+	9943	100			
9952	1(-)	4324.5	2+	5628	6			
		4041	NATURAL	5912	3			
		3918.8	2+	6034	3			
		2524.1	2+	7429	13			
		1460.851	2+	8492	17			
		0	0+	9950 *3*	100			
10090	1	0	0+	10090 *3*	100			
10151	1	0	0+	10151 *3*	100			
10180	1	0	0+	10180 *2*	100			
10362	1,2+	0	0+	10362 *3*	100			
10745	1	0	0+	10745 *3*	100			
10857	1	0	0+	10857 *3*	100			

† Primarily from ^{40}Cl β^- decay and (α,pγ). Values from (α,γ), (γ,γ') and (p,p$'\gamma$) are level-energy differences.
‡ From ^{40}Cl β^- decay, (α,γ), (α,pγ) and (p,p$'\gamma$).
§ From (α,pγ) and (p,p$'\gamma$).

^{40}Cl β^- decay (1.35 min) 1972Kl06,1970Ke12

Parent: ^{40}Cl: E=0; Jπ=2-; $T_{1/2}$=1.35 min *2*; Q=7480 *30*; %β-=100
1972Kl06 (also 1973Kl02,1981HuZT): measured Eγ, Iγ, γγ, $T_{1/2}$.
1970Ke12: measured Eγ, Iγ, γγ, $T_{1/2}$.
1989Mi03: measured βγ coin.
1968Hu07, 1965Gr03, 1956Mo39: measured Eγ, Iγ, $T_{1/2}$.
Thesis (M.S.) by E.L. Robinson (Purdue, 1958). Eγ, Iγ data and level scheme from this work are quoted by 1970Ke12. This thesis was not available to the present evaluators.

^{40}Ar Levels

E(level)	Jπ#	$T_{1/2}$
0	0+	STABLE
1460.77 *5*	2+	
2120.80 *19*	0+	
2524.01 *12*	2+	
2892.43 *21*	4+	
3207.87 *14*	2+	
3511.50 *24*	2+	
3680.48 *14*	3-	
3918.80 *13*	2+	
3941.91 *20*†		
4082.58 *17*	3-	
4178.9 *3*†		
4300.99 *23*	(1,3)-	
4324.5 *3*	2+	
4358.0 *3*†		
4481.0 *3*†	1-	
4562.23 *16*	(1,3)-	
4580.7 *4*†	(2+,3-)	
4737.8 *4*†		
4769.0 *3*	1-	
4942.6 *4*†		
5165.7 *7*	(2,3,4)+	
5269.5 *3*		
5310.0 *10*‡		
5400.5 *8*	1-	
5609.4 *8*	(1,2,3)	
5629.4 *10*‡		
5717.8 *10*†		
5880.1 *4*	1-	
5905.9 *7*	(1-)	
5950.5 *10*	(1,2)	
6053.6 *8*	1	
6133.5 *10*@		
6208.5 *8*	(1,2)	
6276.0 *9*	(1-,2-,3-)	
6338.7 *11*	1(-)	
6476.1 *8*	1(-)	
6651.7 *8*		

† Level considered as improbable based on results of (α,pγ) study of 1983Bi08.
‡ Level considered as improbable since the decay mode is very different from that in (α,pγ) (1983Bi08) from a level near the same energy.
# From Adopted Levels.
@ From 1981HuZT only.

γ(^{40}Ar)

E_{γ}‡	E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	I_{γ}†‡
222.5 *5*	4580.7	(2+,3-)	4358.0		0.20 *6*
239.0 *3*[b]	3918.80	2+	3680.48	3-	0.28 *13*[b]
261.2 *7*[b]	4562.23	(1,3)-	4300.99	(1,3)-	1.0 *1*[b]
270[a]	5880.1	1-	5609.4	(1,2,3)	
303.0 *6*	3511.50	2+	3207.87	2+	0.07 *4*
315.0 *5*	3207.87	2+	2892.43	4+	0.03 *1*
361.3 *5*	4942.6		4580.7	(2+,3-)	0.09 *2*
369.0 *6*	2892.43	4+	2524.01	2+	0.02 *1*
381.0 *5*	4942.6		4562.23	(1,3)-	0.10 *4*
472.0 *4*	3680.48	3-	3207.87	2+	0.3 *1*
479.9 *4*[b]	4562.23	(1,3)-	4082.58	3-	1.1 *2*[b]
621.1 *6*[f]	3511.50	2+	2892.43	4+	<0.3[f]
621.1 *6*[f]	4300.99	(1,3)-	3680.48	3-	<0.3[f]
643.6 *3*[b]	4562.23	(1,3)-	3918.80	2+	8.3 *6*[b]
660.1 *4*[b]	2120.80	0+	1460.77	2+	3.1 *3*[b]
788.1 *3*[b]	3680.48	3-	2892.43	4+	1.0 *1*[b]
881.3 *3*[b]	4562.23	(1,3)-	3680.48	3-	3.2 *3*[b]
1042.3 *3*	6651.7		5609.4	(1,2,3)	0.6 *2*
1051.1 *5*	4562.23	(1,3)-	3511.50	2+	0.6 *1*
1063.1 *2*[b]	2524.01	2+	1460.77	2+	2.9 *3*[b]
1087.6 *4*	3207.87	2+	2120.80	0+	0.10 *5*
1092.9 *8*[b]	4300.99	(1,3)-	3207.87	2+	0.33 *7*[b]
1156.2 *4*	3680.48	3-	2524.01	2+	0.6 *1*
1186.7 *4*	5269.5		4082.58	3-	0.9 *1*
1317.2 *5*	5880.1	1-	4562.23	(1,3)-	0.50 *6*
1333.4 *8*	6276.0	(1-,2-,3-)	4942.6		0.40 *7*
1353.7 *5*	4562.23	(1,3)-	3207.87	2+	0.25 *10*
1394.7 *3*	3918.80	2+	2524.01	2+	1.5 *2*
1432.1 *4*[b]	2892.43	4+	1460.77	2+	2.0 *2*[b]
1460.73 *5*[b]	1460.77	2+	0	0+	100[b]
1558.7 *4*	4082.58	3-	2524.01	2+	0.60 *7*
1579.9 *8*	5880.1	1-	4300.99	(1,3)-	0.4 *1*
1589.0 *3*[b]	5269.5		3680.48	3-	1.2 *2*[b]
1746.5 *2*[b]	3207.87	2+	1460.77	2+	3.3 *3*[b]
1776.9 *8*	4300.99	(1,3)-	2524.01	2+	0.020 *3*
1797.8 *2*[b]	3918.80	2+	2120.80	0+	2.7 *4*[b]
2050.5 *4*	3511.50	2+	1460.77	2+	1.3 *2*
2063.0 *10*	5269.5		3207.87	2+	0.5 *2*
2220.0 *2*[b]	3680.48	3-	1460.77	2+	8.6 *12*[b]
2457.7 *4*[b]	3918.80	2+	1460.77	2+	5.8 *10*[b]
2524.1 *2*[b]	2524.01	2+	0	0+	2.5 *3*[b]
2621.7 *2*[b]	4082.58	3-	1460.77	2+	18.1 *16*[b]
2840.1 *3*[b]	4300.99	(1,3)-	1460.77	2+	34 *5*[b]
3101.7 *4*[b]	4562.23	(1,3)-	1460.77	2+	14.0 *20*[d]
3193.7 *10*[c]	5717.8		2524.01	2+	0.10 *5*
3208.2 *3*	3207.87	2+	0	0+	0.6 *1*
3356.6 *8*	5880.1	1-	2524.01	2+	0.4 *1*
3511.0 *5*	3511.50	2+	0	0+	0.20 *8*
3704.6 *8*	5165.7	(2,3,4)+	1460.77	2+	1.0 *1*
3759.9 *10*	5880.1	1-	2120.80	0+	0.10 *3*
3784.9 *6*	5905.9	(1-)	2120.80	0+	0.8 *1*
3918.6 *2*[b]	3918.80	2+	0	0+	4.8 *5*[b]
3941.7 *2*[c]	3941.91		0	0+	0.20 *5*
4082.1 *8*	4082.58	3-	0	0+	0.30 *6*
4147.7 *10*	5609.4	(1,2,3)	1460.77	2+	1.1 *1*
4178.7 *3*[c]	4178.9		0	0+	0.30 *7*
4324.2 *3*	4324.5	2+	0	0+	0.20 *5*
4357.6 *3*[c]	4358.0		0	0+	0.50 *7*

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

E_γ[‡]	E_i^{level}	J_i^π	E_f^{level}	J_f^π	I_γ[†‡]
4480.7 *3*[c]	4481.0	1-	0	0+	0.30 *7*
4580.1 *5*[c]	4580.7	(2+,3-)	0	0+	0.10 *4*
4737.5 *4*[c]	4737.8		0	0+	0.5 *1*
4768.7 *3*	4769.0	1-	0	0+	0.6 *1*
5165.5 *10*	5165.7	(2,3,4)+	0	0+	0.10 *5*
5309.6 *10*[c]	5310.0		0	0+	0.2 *1*
5400.1 *8*	5400.5	1-	0	0+	0.20 *8*
5629.0 *10*[c]	5629.4		0	0+	0.10 *5*
5879.6 *12*[b]	5880.1	1-	0	0+	5.0 *4*[b]
5950.0 *10*	5950.5	(1,2)	0	0+	0.05 *3*
6053.1 *8*	6053.6	1	0	0+	0.40 *6*
6133[a]	6133.5		0	0+	≈0.05[e]
6208.0 *8*	6208.5	(1,2)	0	0+	0.05 *3*
6338.2 *11*[b]	6338.7	1(-)	0	0+	0.32 *9*[b]
6475.5 *8*	6476.1	1(-)	0	0+	0.20 *3*

[†] For absolute intensity per 100 decays, multiply by 0.81 *4*
[‡] From 1972Kl06, unless otherwise stated.
[a] From 1981HuZT only, intensity is not available.
[b] Weighted average from 1972Kl06 and 1970Ke12.
[c] Placement questioned by 1983Bi08 based on their (α,pγ) study.
[d] From 1972Kl06, obtained in indirect method. Other: 5 *3* in 1970Ke12.
[e] From β feeding quoted by 1981HuZT.
[f] Multiply placed with undivided intensity.

β^- radiations

$E\beta^-$	E(level)	$I\beta^-$	Log *ft*	Comments
(8.3E+2)	6651.7	0.49 *16*	4.8 *2*	av Eβ=301 *14*.
(1.00E+3)	6476.1	0.16 *3*	5.6 *1*	av Eβ=376 *14*.
(1.14E+3)	6338.7	0.26 *8*	5.6 *2*	av Eβ=436 *15*.
(1.20E+3)	6276.0	0.32 *6*	5.6 *1*	av Eβ=464 *15*.
(1.27E+3)	6208.5	0.041 *25*	6.6 *3*	av Eβ=494 *15*.
(1.35E+3)	6133.5	0.04	6.7	av Eβ=527 *15*. Iβ: from 1981HuZT.
(1.43E+3)	6053.6	0.32 *6*	5.9 *1*	av Eβ=563 *15*.
(1.53E+3)	5950.5	0.041 *25*	6.9 *3*	av Eβ=610 *15*.
(1.57E+3)	5905.9	0.65 *9*	5.8 *1*	av Eβ=631 *15*.
(1.60E+3)	5880.1	5.2 *5*	4.91 *6*	av Eβ=642 *15*.
(1.76E+3)	5717.8	0.08 *4*	6.9 *2*	av Eβ=717 *15*.
(1.85E+3)	5629.4	0.08 *4*	7.0 *2*	av Eβ=758 *15*.
(1.87E+3)	5609.4	0.89 *10*	6.0 *1*	av Eβ=767 *15*.
(2.08E+3)	5400.5	0.16 *7*	6.9 *2*	av Eβ=865 *15*.
(2.17E+3)	5310.0	0.16 *9*	7.0 *3*	av Eβ=907 *15*.
(2.21E+3)	5269.5	2.1 *3*	5.9 *1*	av Eβ=926 *15*.
(2.31E+3)	5165.7	0.89 *10*	6.4 *1*	av Eβ=975 *16*.
(2.71E+3)	4769.0	0.49 *9*	6.9 *1*	av Eβ=1164 *16*.
(2.74E+3)	4737.8	0.41 *9*	7.0 *1*	av Eβ=1179 *16*.
(2.90E+3)	4580.7	0.17 *7*	7.5 *2*	av Eβ=1254 *16*.
(2.92E+3)	4562.23	22.6 *21*	5.38 *5*	av Eβ=1263 *16*. Energy: 2729 *145* (1989Mi03) from β(3101γ).
(3.00E+3)	4481.0	0.24 *6*	7.4 *1*	av Eβ=1302 *16*.
(3.12E+3)	4358.0	0.24 *8*	7.5 *2*	av Eβ=1361 *16*.
(3.16E+3)	4324.5	0.16 *5*	7.7 *2*	av Eβ=1377 *16*.
(3.18E+3)	4300.99	27 *5*	5.5 *1*	av Eβ=1389 *16*. Energy: 3086 *75* (1989Mi03) from β(2840γ).
(3.30E+3)	4178.9	0.24 *6*	7.6 *1*	av Eβ=1448 *16*.
(3.40E+3)	4082.58	13.8 *15*	5.9 *1*	av Eβ=1494 *16*.

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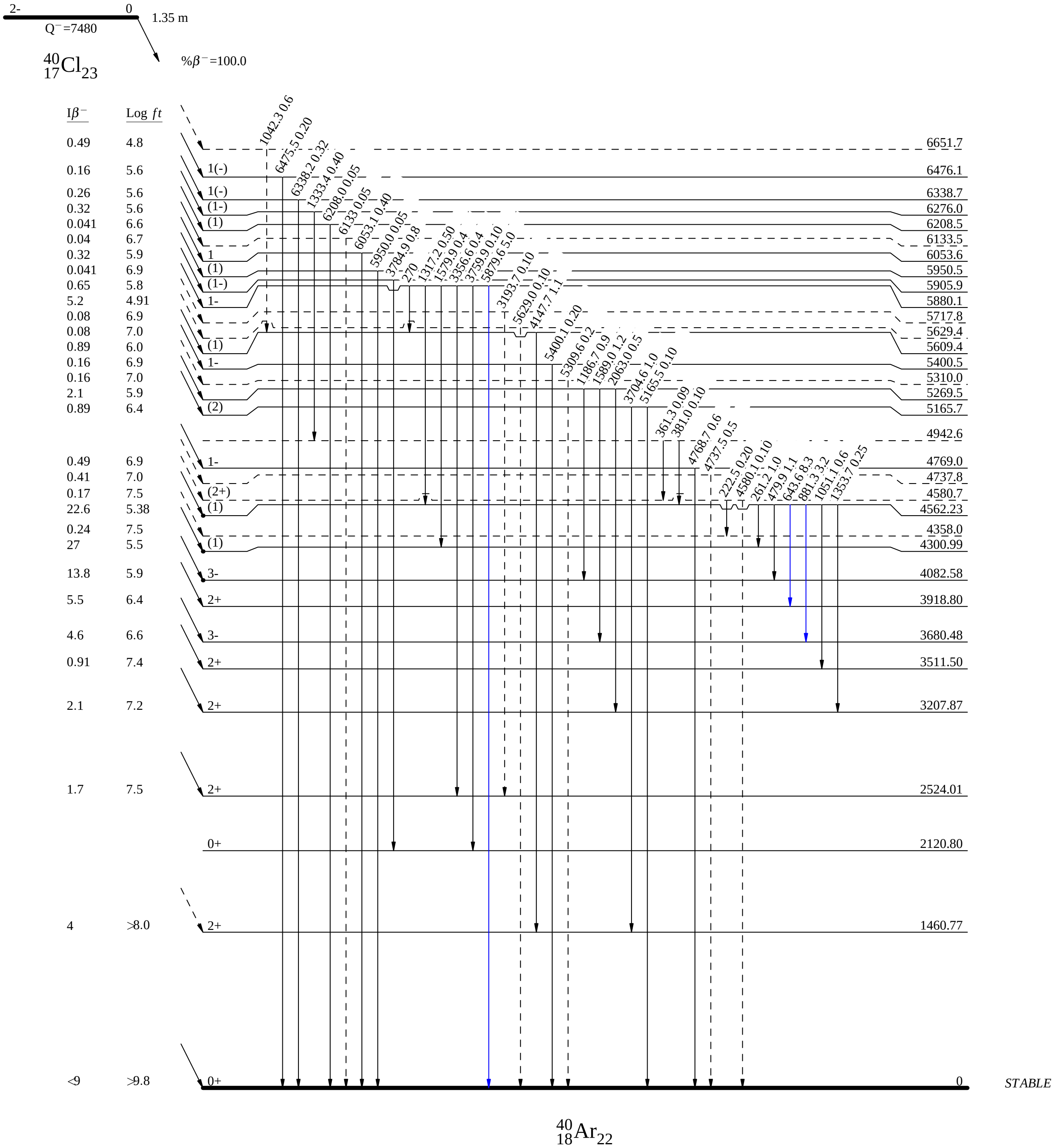
β^- radiations (continued)

$E\beta^-$	E(level)	$I\beta^-$	Log *ft*	Comments
				Energy: 3070 *100* (1989Mi03) from β(2622γ).
(3.54E+3)	3941.91	0.16 *6*	7.9 *2*	av Eβ=1562 *16*.
(3.56E+3)	3918.80	5.5 *12*	6.4 *1*	av Eβ=1573 *16*.
(3.80E+3)	3680.48	4.6 *11*	6.6 *1*	av Eβ=1689 *16*.
(3.97E+3)	3511.50	0.91 *21*	7.4 *1*	av Eβ=1771 *16*.
(4.27E+3)	3207.87	2.1 *4*	7.2 *1*	av Eβ=1919 *16*.
(4.59E+3)	2892.43	0.68 *20*	9.5 *1*	av Eβ=2085 *16*.
(4.96E+3)	2524.01	1.7 *5*	7.5 *1*	av Eβ=2253 *16*.
(6.02E+3)	1460.77	4 *4*	$>$8.0	av Eβ=2774 *16*.
(7.48E+3)	0	$<$9	$>$9.8	av Eβ=3500 *16*. Energy: 7390 *118* (1989Mi03). Iβ: only available experimental value is 9% from E.L. Robinson (M.S. thesis, Purdue, 1958). This value has been quoted in several papers (1989Mi03,1981HuZT,1972Kl06,1970Ke12) and in Endt′s compilations. 1970Ke12 quoted Iβ=9-18%, again based on Robinson′s data, suggesting equal feedings to the ground state and the first excited state. The singles β spectrum of 1989Mi03 does show that there is a direct feeding to the ground state, but in the opinion of the evaluators, precise feeding is not known. log $f^{1u}t$>8.5 expected for first-forbidden unique transition allows up to 100% feeding.

Decay Scheme

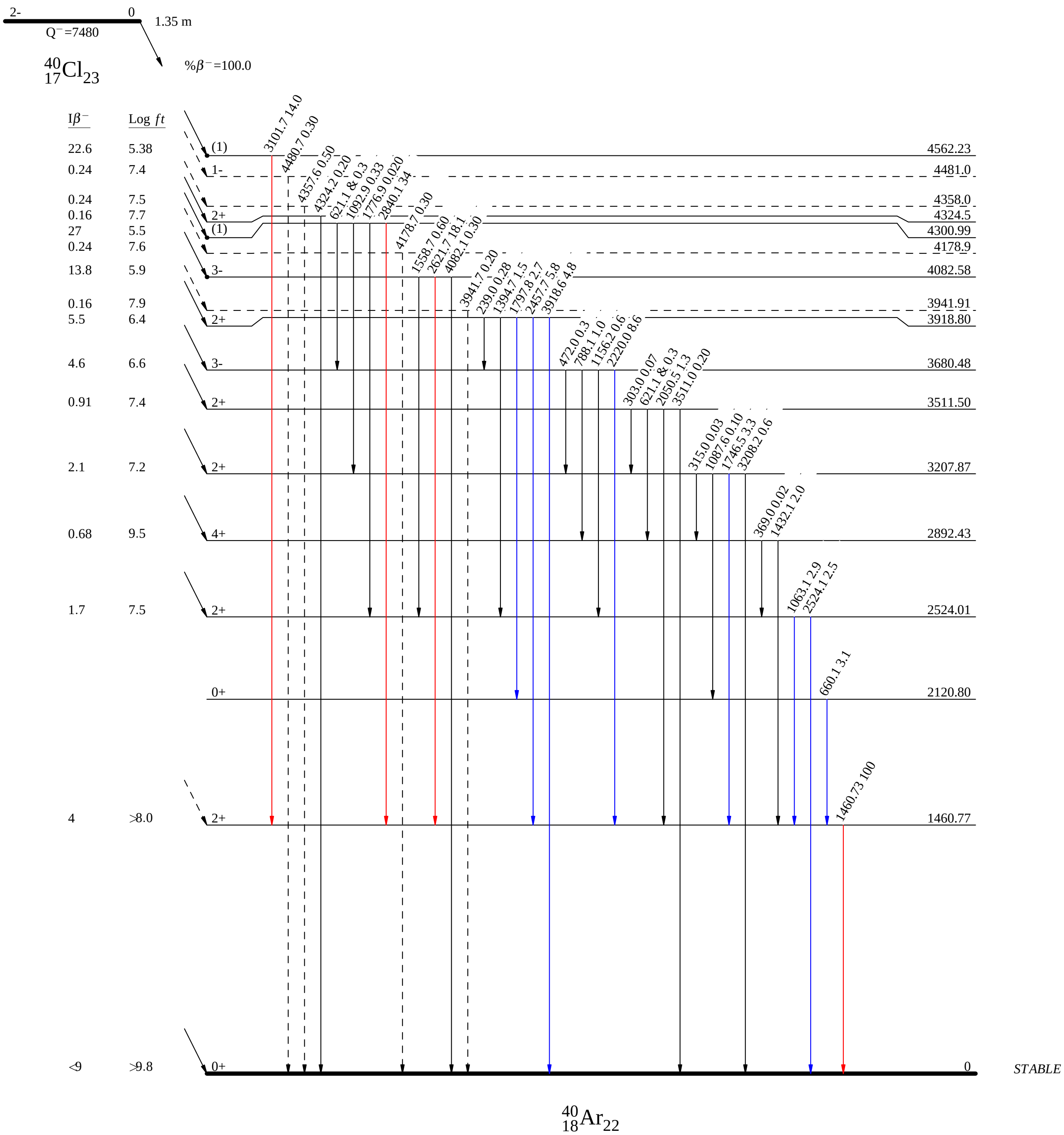
Intensities: I_γ per 100 parent decays



Decay Scheme (continued)

Intensities: I_γ per 100 parent decays

& Multiply placed: undivided intensity given



^{40}K ε decay (1.248×10^9 y) 1999BeZQ,1999BeZS

Parent: ^{40}K: E=0; Jπ=4-; $T_{1/2}$=1.248×10^9 y *3*; Q=1504.69 *19*; %ε=10.86 *13*

J: From unique 3rd forbidden β^- spectral shape for decay to 0+ level and L transfer in charge-particle reactions.

T: From 2004Ko09 and 2002Gr01; the same value from measurements of specific activity of natural potassium salts using liquid-scintillation counting (LSC) technique. (2002Gr01 reported a value of 1.248×10^9 y *2*, later adjusted to 1.248×10^9 y *3* by 2004Ko09 to correct the quoted uncertainty on measured isotopic abundance of ^{40}K). Both papers used natural abundance of ^{40}K as 0.01167% *2* (1975Ga24). The natural abundance of ^{40}K=0.0117% *1* (as recommended in the International Union of Pure and Applied Chemistry 70, 217 (1998), based on the measured value of 1975Ga24) would give about four times larger uncertainty on $T_{1/2}$. The earlier values of 1.265×10^9 y *13* (1999BeZS,1999BeZQ) based on recomputation of 1.277×10^9 y *8* (evaluation by 1973EnVA); and 1.26×10^9 y *1* (evaluation by 1990Ho28 from 14 different measurements out of a total of 34 measurements listed) are in good agreement. Variation of $T_{1/2}$ due to environmental conditions has been studied by 2001No10, where no significant effect has been reported. Earlier (pre-1977) measurements of partial (β^- and ce) and/or total $T_{1/2}$ of ^{40}K: 1977Ce04, 1972Go21, 1966Fe09, 1965Le15, 1965Br25, 1962Fl05, 1961Gl07, 1960Sa31, 1960Eg01, 1959Ke26, 1957We43, 1956Mc20, 1955Ba25, 1955Ko21, 1955Su38, 1953Bu58, 1950Sa52, 1947Gl07. Another 16 references (from 1931 to 1971) are listed by 1990Ho28 and in the 1978 Table of Isotopes (1978LeZA); but are not present in the NSR database.

Q(g.s.): From 2003Au03.

1999BeZQ, 1999BeZS: evaluations of ^{40}K decay.

Measurements: 2004Ko09, 2002Gr01, 2001No10, 1977Ce04, 1972Go21, 1967Mc10, 1966Fe09, 1965Le15, 1965Br25, 1962Fl05, 1962En01, 1961Gl07, 1960Sa31, 1960Eg01, 1959Ke26, 1957We43, 1956Mc20, 1955Ba25, 1955Ko21, 1955Su38, 1953Bu58, 1952Fe16, 1951Go29, 1951De34, 1950Sa52, 1949Ov01, 1948Ev09, 1947Gl07. This list is not complete, see 1978LeZA for several other references that are not present in NSR database.

The decay scheme, which includes the β^- decay to the ground state of ^{40}Ca and two levels in ^{40}Ar, is complete since these are the only levels in the daughter nuclides below the respective decay energies.

In principle, the 1460-keV γ ray could be used for energy calibration. However, in a Ge semiconductor detector the apparent γ-ray energy depends on the source-detector configuration and ^{40}K sources usually consist of a large volume of material, so this Eγ is usually not useful. This also means that in most cases the uncertainty in the observed energy is much larger than that given here.

^{40}Ar Levels

E(level)	J$^\pi$	$T_{1/2}$	Comments
0	0+	STABLE	
1460.851 *6*	2+		Jπ: from Adopted Levels.

γ(^{40}Ar)

Eγ	E_i^{level}	J_i^π	E_f^{level}	J_f^π	I$\gamma^\dagger$	Mult.	α	Comments
1460.822 *6*	1460.851	2+	0	0+	10.66 *13*	E2	2.95×10^{-5} *9*	Eγ: evaluator scaled down the value of 1460.830 *5* (1979He13) by 5.8 ppm so that it corresponds to the energy scale of 2000He14. Others: 1460.75 *6* (1967Ki10), 1460.95 *7* (1970Ja15). Iγ: Iγ(1460)=I(ε,1460)/(1+α+IPFC)=10.66 *13*/1.000102 *5*. α: α(K)=2.65×10^{-5} *8* and α(L)=2.22×10^{-6} *7* interpolated from tables of 1976Ba63 and α=α(K)+1.33*LC. Internal-pair-formation coefficient is IPFC=7.3×10^{-5} *5*, interpolated from tables of 1979Sc31.

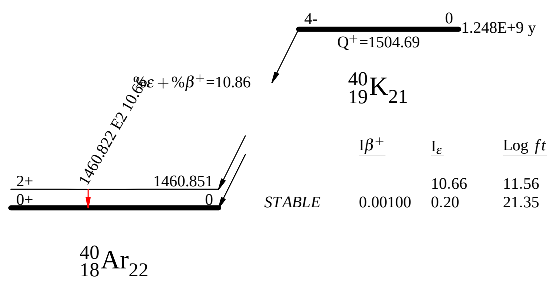
† For absolute intensity per 100 decays, multiply by 1.000 *12*.

ε,β^+ radiatons

Eε	E(level)	Iε	Log *ft*	$I(\varepsilon+\beta^+)$	Comments
(43.84)	1460.851	10.66 *13*	11.56 *1*	10.66 *13*	εK=0.763 *2*. CL=0.209 *1*. εM+=0.0274 *2*.
(1504.69)	0	0.20 *10*	21.35	0.20 *10*	av Eβ=238.2 *3*. εK=0.8795 *21*. CL=0.08623 *21*. εM+=0.01264 *3*. Iε: from $\beta^+/\beta^-=1.12\times10^{-5}$ *14* (1973EnVA), $I(\beta^+)$=0.00100 *13*. The evaluator has estimated the ε/β^+ ratio is 200 *100*. log *ft*: from private communication from R. B. Firestone; see also 1970Wa11.

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{26}Mg(^{16}O,2pγ),^{27}Al(^{18}O,p$\alpha\gamma$) 1977Eg01,1975Wa23

1977Eg01: E(^{16}O)=34 MeV. Measured $\gamma\gamma$, $\gamma(\theta)$, γ(lin pol).
1975Wa23: E(^{18}O)=35 MeV. Measured γ, $\gamma(\theta)$, lifetime.

^{40}Ar Levels

E(level)	J$^{\pi}$†	$T_{1/2}$	Comments
0	0+		
1460.81 *4*	2+		
2892.60 *11*	4+	2.9 ps *14*	$T_{1/2}$: from recoil-distance method (1975Wa23).
3464.48 *13*	6+		

† From Adopted Levels.

γ(^{40}Ar)

A_2, A_4 and polarization coefficients are from 1977Eg01.

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ†	I_γ‡	Mult.	Comments
1460.81	2+	0	0+	1460.78 *4*	108 *2*	E2	A_2=+0.230 *20*, A_4=-0.100 *20*. POL=+0.30 *11*.
2892.60	4+	1460.81	2+	1431.76 *10*	70 *2*	E2	A_2=+0.290 *20* A_4=-0.13 *3* POL=+0.40 *11*.
3464.48	6+	2892.60	4+	571.88 *8*	41 *2*	E2	A_2=+0.40 *3*, A_4=-0.10 *3*. POL=+0.40 *20*.

† From 1975Wa23, the values are either from ^{27}Al(^{18}O,p$\alpha\gamma$) or from ^{37}Cl(α,pγ).
‡ From 1977Eg01.

$^{36}S(\alpha,\gamma)$:resonances 1988Cs02,1986Jo09

Includes $^{36}S(\alpha,\alpha)$: resonances in ^{40}Ar from 1994An39.
1988Cs02, 1986Jo09: E=2.35-3.50 MeV. Measured Eγ, Iγ, $\gamma(\theta)$, lifetimes by DSA.
1994An39: $^{36}S(\alpha,\alpha)$ E=12.56-15 MeV. Measured $\sigma(\theta)$. Deduced resonances in ^{40}Ar at Eα=13320 (Jπ=7-) and Eα=14120 (Jπ=8+).

^{40}Ar Levels

E(level)†	Jπ‡	T or Γ#	Eα(lab)&	(2J+1)$\Gamma_\alpha\Gamma_\gamma/\Gamma$ (eV)@	Comments
0	0+				
1461	2+				
2121	0+				
2524	2+	0.50 ps *8*			$T_{1/2}$: average of measurements at E(α)=3210 and 3500.
2893	4+				
3208	2+	62 fs *12*			$T_{1/2}$: measured at E(α)=3210.
3511	2+	62 fs *12*			$T_{1/2}$ measured at E(α)=3210.
3681	3-				
3919	2+				
4041					
4082	3-				
4301	(1,3)-				
4324	2+	15 fs *6*			$T_{1/2}$: average of measurements at E(α)=3210 and 3500.
4473	1				
4602		73 fs *12*			$T_{1/2}$ measured at E(α)=3210.
8919 *3*	1-		2353	0.10 *5*	$\Gamma_\alpha/\Gamma_\gamma\leq$0.11, $\gamma_\gamma\geq$0.33 eV (1988Cs02).
9127 *3*	1-	0.72 eV *16*	2584	0.18 *3*	$\Gamma_\alpha/\Gamma_\gamma$=0.10 *2*, Γ_α=0.07 eV *2*, Γ_γ=0.65 eV *16*, $\Gamma_{\gamma0}$=0.65 eV *17* (1988Cs02).
9138 *6*	(1-,2+)		2597	0.2 *1*	
9147 *5*	1-		2607	0.2 *1*	
9178 *3*	1-		2641	0.2 *1*	
9197 *6*	(1-,2+)		2662	0.2 *1*	
9216 *4*	1-		2683	0.030 *15*	
9234 *4*	1-		2703	0.30 *15*	
9240 *6*	1-		2710	0.10 *5*	
9264 *4*	(1-,2+)		2737	0.10 *5*	
9273 *6*	1-		2747	0.030 *15*	
9287 *4*			2762	0.30 *15*	
9296 *5*	(1-,2+)		2772	0.30 *15*	
9314 *4*	(1-,2+)		2792	0.10 *5*	
9330 *4*	1-		2810	0.10 *5*	
9339 *4*	1-		2820	0.30 *15*	
9355 *3*	1-	1.1 eV *3*	2838	0.8 *1*	$\Gamma_\alpha/\Gamma_\gamma$=0.63 *17*, Γ_α=0.43 eV *21*, Γ_γ=0.69 eV *23*, $\Gamma_{\gamma0}$=0.60 eV *21* (1988Cs02).
9373 *4*			2858	0.30 *15*	
9408 *4*	1-		2897	0.5 *1*	
9417 *4*	1-	4.0 eV *20*	2907	0.8 *1*	$\Gamma_\alpha/\Gamma_\gamma$=0.07 *3*, Γ_α=0.10 eV *5*, Γ_γ=3.9 eV *20*, $\Gamma_{\gamma0}$=1.4 eV *7* (1988Cs02).
9425 *5*	(1-,2+)		2916	0.10 *5*	
9433 *5*	(1-,2+)		2925	0.4 *2*	
9450 *3*	1-		2943	0.9 *2*	
9472 *4*	(1-,2+)		2968	0.10 *5*	
9485 *5*	1-		2982	0.2 *1*	
9491			2989		
9504.8 *14*	1-	8.2 eV *18*	3004.4	3.3 *4*	$\Gamma_\alpha/\Gamma_\gamma$=0.19 *4*, Γ_α=1.3 eV *5*, Γ_γ=6.9 eV *17*, $\Gamma_{\gamma0}$=6.2 eV *16* (1988Cs02).
9527 *4*			3029	0.7 *3*	
9565 *4*	1-		3071	0.30 *15*	
9581 *3*	1-		3089	4.6 *7*	
9586 *6*	(1-,2+)		3095	0.9 *4*	
9596 *4*			3106	0.6 *3*	
9608 *5*			3119	0.6 *3*	

Continued on next page (footnotes at end of table)

^{40}Ar Levels (continued)

E(level)[†]	J^{π}[‡]	T or Γ[#]	Eα(lab)[&]	(2J+1)$\Gamma_\alpha\Gamma_\gamma/\Gamma$ (eV)[@]	Comments
9618 *3*	1-		3130	2.5 *4*	
9656 *4*	1-		3172	0.30 *15*	
9669 *4*	1-		3187	0.6 *3*	
9687 *3*	(1-,2+)		3207	2.4 *7*	Transition to 4041 level is not seen.
9694 *5*	(1-,2+)		3215	1.5 *8*	
9736 *3*	1-		3262	1.3 *2*	No 4785γ is identified.
9759 *4*	1(-)		3287	0.10 *5*	$\Gamma_\alpha/\Gamma_\gamma \leq 0.07$, $\Gamma_\gamma \geq 0.53$ eV.
9769 *4*	(1-,2+)		3298	0.10 *5*	
9787 *4*	1-		3318	0.8 *4*	
9813 *3*	1-		3347	1.5 *8*	
9825 *3*	1-		3360	1.9 *2*	
9849 *3*	1-	22 eV *6*	3387	1.9 *2*	E(level): doublet: 9849+9852. $\Gamma_\alpha/\Gamma_\gamma$=0.03 *1*, Γ_α=0.65 eV *29*, Γ_γ=22 eV *6*, $\Gamma_{\gamma 0}$=10 eV *3* (1988Cs02).
9852 *5*			3391	0.7 *3*	
9866 *4*			3406	0.2 *1*	
9881 *4*	1-		3423	0.10 *5*	
9893 *4*	1-		3436	0.2 *1*	
9912 *5*	(1-,2+)		3457	0.2 *1*	
9944 *3*	1-		3493	2.8 *4*	
9954 *3*	1(-)	≥9.6 eV	3503	5.5 *7*	$\Gamma_\alpha/\Gamma_\gamma$=2.9 *10*, $\Gamma_\alpha \geq 7.1$ eV, $\Gamma_\gamma \geq 2.5$ eV, $\Gamma_{\gamma 0} \geq 1.7$ eV (1988Cs02).

[†] Rounded-off values from Adopted Levels up to 4602. The excitation energies of resonances are deduced from Eα(lab). Excitation energy=Eα(c.m.)+S(α)(^{40}Ar), where S(α)=6800.74 *19* (2003Au03).
[‡] Most assignments above 8 MeV are based on $\gamma(\theta)$ measurements; below this energy the assignments are from Adopted Levels.
[#] Half-life from DSAM (1988Cs02). Γ from 1988Cs02.
[@] From 1986Jo09 (also in 1988Cs02).
[&] From 1986Jo09 (also in 1988Cs02), uncertainty is the same as given for the excitation energy.

$\gamma(^{40}Ar)$

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]
1461	2+	0	0+	1461	
2121	0+	1461	2+	660	
2524	2+	1461	2+	1063	
		0	0+	2524	
2893	4+	1461	2+	1432	
3208	2+	1461	2+	1747	
3511	2+	1461	2+	2050	
3681	3-	1461	2+	2220	
3919	2+	0	0+	3919	
4041		2524	2+	1517	63 *10*[e]
		1461	2+	2580	37 *10*[e]
4082	3-	1461	2+	2621	
4301	(1,3)-	1461	2+	2840	
4324	2+	1461	2+	2863	30 *6*
		0	0+	4324	70 *6*
4473	1	0	0+	4473	
4602		2524	2+	2078	
9127	1-	0	0+	9127	100
9355	1-	4473	1	4882[f]	
		4301	(1,3)-	5054	6
		3919	2+	5436	7
		0	0+	9355	87
9408	1-			5331[gd]	19[gd]
				5494[gd]	14[gd]

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γ(^{40}Ar) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡
				5902[gd]	18[gd]
				6889[gd]	3[gd]
				7952[gd]	11[gd]
				9413[gd]	35[gd]
9417	1-			5331[gd]	19[gd]
				5494[gd]	14[gd]
				5902[gd]	18[gd]
				6889[gd]	3[gd]
				7952[gd]	11[gd]
		0	0+	9413[gd]	35[gd]
9450	1-	3511	2+	5939	8
		3208	2+	6242	8
		2893	4+	6557	4
		2524	2+	6926	13
		2121	0+	7329	12
		1461	2+	7989	35
		0	0+	9450	24
9504.8	1-	3919	2+	5586	3
		2121	0+	7384	2
		1461	2+	8044	6
		0	0+	9505	89
9581	1-	3919	2+	5664[gc]	5[gc]
		2893	4+	6690[gc]	5[gc]
		2524	2+	7059[gc]	11[gc]
		2121	0+	7462[gc]	25[gc]
		1461	2+	8122[gc]	18[gc]
				9583[gc]	41[gc]
9586	(1-,2+)	3919	2+	5664[gc]	5[gc]
		2893	4+	6690[gc]	5[gc]
		2524	2+	7059[gc]	11[gc]
		2121	0+	7462[gc]	25[gc]
		1461	2+	8122[gc]	18[gc]
		0	0+	9583[gc]	41[gc]
9618	1-	3919	2+	5699	5
		3681	3-	5937	2
		3511	2+	6107	2
		3208	2+	6410	4
		2893	4+	6725	3
		2524	2+	7094	7
		2121	0+	7497	3
		1461	2+	8157	46
		0	0+	9618	31
9687	(1-,2+)			5088[gb]	14[gb]
				5366[gb]	8[gb]
				5771[gb]	6[gb]
				6179[gb]	6[gb]
				6482[gb]	5[gb]
				7166[gb]	54[gb]
				8229[gb]	4[gb]
				9690[gb]	3[gb]
9694	(1-,2+)			5088[gb]	14[gb]
				5366[gb]	8[gb]
				5771[gb]	6[gb]
				6179[gb]	6[gb]
				6482[gb]	5[gb]
				7166[gb]	54[gb]

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	$E\gamma$[†]	$I\gamma$[‡]
				8229[gb]	4[gb]
		0	0+	9690[gb]	3[gb]
9736	1-	4602		5134	5
		3919	2+	5817	13
		3208	2+	6528	11
		2524	2+	7212	5
		2121	0+	7615	7
		1461	2+	8275	11
		0	0+	9736	48
9825	1-	3919	2+	5906	10
		3681	3-	6144	9
		3511	2+	6314	2
		3208	2+	6617	13
		2524	2+	7301	17
		2121	0+	7704	7
		1461	2+	8364	25
		0	0+	9825	17
9849	1-	2893	4+	6957[ga]	9[ga]
		2524	2+	7326[ga]	28[ga]
		1461	2+	8389[ga]	25[ga]
		0	0+	9850[ga]	47[ga]
9852		2893	4+	6957[ga]	9[ga]
		2524	2+	7326[ga]	28[ga]
		1461	2+	8389[ga]	25[ga]
		0	0+	9850[ga]	47[ga]
9944	1-	4473	1	5471	4
		3919	2+	6025	5
		2524	2+	7420	23
		2121	0+	7823	9
		1461	2+	8483	25
		0	0+	9944	38
9954	1(-)	4324	2+	5630	4
		4041		5913	2
		3919	2+	6035	2
		2524	2+	7430	9
		1461	2+	8493	12
		0	0+	9954	71

[†] Level-energy differences. For levels below 4602, $E\gamma$'s are based on adopted gammas.
[‡] From 1988Cs02. Uncertainties are 10% for strong lines and up to 50% for weakest lines.
[a] γ decays from 9849 and 9852 are unresolved. Quoted $E\gamma$ corresponds to the average deduced from the decay of two levels.
[b] γ decays from 9687 and 9694 are unresolved. Quoted $E\gamma$ corresponds to the average deduced from the decay of two levels.
[c] γ decays from 9581 and 9586 are unresolved. Quoted $E\gamma$ corresponds to the average deduced from the decay of two levels.
[d] γ decays from 9408 and 9417 are unresolved. Quoted $E\gamma$ corresponds to the average deduced from the decay of two levels.
[e] Measured at 3503 resonance.
[f] Weak γ.
[g] Multiply placed with undivided intensity.

^{37}Cl(α,pγ) 1983Bi08

1983Bi08: E=12, 13 MeV. Measured γ, pγ coin, γ(lin pol), lifetimes by DSA.
Others:.
1975Wa23: E=12 MeV. Measured γ, lifetime by recoil-distance method. Data for 1461, 2893 and 3464 levels.
1975Po13: E=10.6 MeV. Measured γ, pγ(t). Lifetime of 3464 level.
1971Ja15: E=6.25, 7.00, 8.00 MeV. Measured γ, γ(θ), lifetimes by DSA. Data for 1461, 2121, 2525, 2893, 3208 and 3515 levels.
1970Cu02: E=8.40 MeV. Measured Eγ, lifetime by DSA for 1461 level.

^{40}Ar Levels

Nuclear Level Sequences

A Member of $f^2_{7/2}$ yrast sequence.
B 0+ deformed band.

Seq.	E(level)	Jπ†	$T_{1/2}$‡	Comments
A	0	0+		
A	1460.81 *4*	2+	1.39 ps *28*	$T_{1/2}$: 0.83 ps *26* (1971Ja15), 1.7 ps *+125-9* (1970Cu02).
B	2121 *1*	0+	>2.8 ps	$T_{1/2}$: 6.2 ps *+90-28* (1971Ja15).
B	2524 *1*	2+	0.27 ps *4*	$T_{1/2}$: 0.19 ps *5* (1971Ja15).
A	2892.60 *11*	4+	2.2 ps *6*	$T_{1/2}$: others: <12 ps (1975Wa23), 2.8 ps *+56-14* (1971Ja15).
	3208 *1*	2+	28 fs *14*	
A	3464.48 *13*	6+	0.693 ns *21*	$T_{1/2}$: from direct timing (1975Po13). Others: 0.645 ns *35* from recoil-distance method (1975Wa23), >2.8 ps (1983Bi08).
	3511 *1*	1,2+	49 fs *14*	Jπ: 2+ in Adopted Levels.
B	3515 *1*	4+	0.139 ps *28*	Jπ: 4- and 3 are not allowed by RUL for implied multipolarities.
	3681 *1*	3-	0.132 ps *28*	
	3919 *1*	2+	0.28 ps *3*	
	4041 *1*			
	4082 *1*	2-,3-	40 fs *14*	Jπ: 3- in Adopted Levels.
	4226 *1*	4-	>2.8 ps	Jπ: 3 is not allowed by RUL for implied multipolarities.
	4229 *1*		0.166 ps *28*	
	4300 *1*	1-,2-,3-	58 fs *14*	Jπ: (1,3)- in Adopted Levels.
	4328 *1*	1,2+	18 fs *7*	Jπ: 2+ in Adopted Levels.
	4420 *1*			
	4427 *1*	3+,4,5+	125 fs *21*	Jπ: 3-, 5- not allowed by RUL for implied multipolarities; (4+) in Adopted Levels.
	4473 *1*	(1)		Jπ: 1,2+ from γ to 0+; J=1 is favored by a similar state in ^{42}Ca.
	4494 *1*	5-	0.50 ps *7*	
	4562 *1*	1-,2-,3-		Jπ: (1,3)- in Adopted Levels.
	4578 *1*	2+,3	37 fs *14*	Jπ: (2+,3-) in Adopted Levels.
	4602 *1*	(1,2,3)-	33 fs *14*	Jπ: (0+:4+) in Adopted Levels.
	4674 *1*		66 fs *17*	
	4769 *1*	(1,2+)		Jπ: 1- in Adopted Levels.
	4794 *1*	3+,4+	52 fs *14*	Jπ: π=- is rejected by RUL; 4+ in Adopted Levels.
	4858 *1*	5-	37 fs *10*	
	4929 *1*			
B	4959 *1*	(6+)	0.10 ps *4*	Jπ: 4+,5+ are less likely, but not ruled out.
	4972 *1*			
	4991 *1*	4(-)	2.1 ps *7*	
	5115 *2*			
	5143 *2*		<10 fs	
	5166 *2*			
	5245 *2*			
	5269 *2*			
	5293 *2*			
	5310 *2*			
	5350 *2*			
	5378 *2*			

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^{40}Ar Levels (continued)

Seq.	E(level)	Jπ†	$T_{1/2}$‡	Comments
	5508 *2*			
	5544 *2*			
	5559 *2*			
	5608 *2*			
	5611 *2*			
	5630 *2*			
	5654 *2*			
	5662 *2*			
	5675 *2*			
	5766 *2*			
	5818 *2*			
	5885 *2*			
	5912 *2*			
	5931 *2*			
	5973 *2*	(6-)		Jπ: no assignment in Adopted Levels.
	6013 *2*	(7-)		Jπ: (4+:7-) in Adopted Levels.
	6099 *2*			
	6104 *2*			
	6138 *2*			
	6158 *2*			
	6185 *2*			
	6203 *2*			
	6270 *2*			
	6305 *2*			
	6356 *2*			
B	6806 *2*	(8+)		Jπ: from analog in ^{42}Ca (1983Bi08).
	6979 *2*	(8-)		Jπ: from analog in ^{42}Ca (1983Bi08).

† As proposed by 1983Bi06 based on γ(θ) and γ(lin pol); the assignments for low-lying levels are mostly from Adopted Levels.
‡ From DSA (1983Bi08), unless otherwise stated.

γ(^{40}Ar)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ	Mult.	δ	Comments
1460.81	2+	0	0+	1460.78 *4*[a]	100			
2121	0+	1460.81	2+	660	100			
2524	2+	1460.81	2+	1063	57 *1*			
		0	0+	2524	43 *1*			Iγ: Iγ(2524)/Iγ(1063)=38/62.
2892.60	4+	1460.81	2+	1431.76 *10*[a]	100			
3208	2+	1460.81	2+	1747	90 *1*			
		0	0+	3208	10 *1*			
3464.48	6+	2892.60	4+	571.88 *8*[a]	100			
3511	1,2+	2524	2+	987	5 *1*			
		1460.81	2+	2050	81 *3*			
		0	0+	3511	14 *2*			
3515	4+	2892.60	4+	622	31 *2*	M1(+E2)	-0.07 *10*	A_2=+0.45 *3*, A_4=-0.04 *4*. δ: -0.4 to -1.3 for J=3.
		2524	2+	991	9 *5*			
		1460.81	2+	2054	60 *2*			
3681	3-	2892.60	4+	788	10 *1*			
		2524	2+	1157	4.0 *5*			
		1460.81	2+	2220	86 *2*			
3919	2+	2524	2+	1395	13 *2*			
		2121	0+	1798	9 *2*			
		1460.81	2+	2458	18 *2*			

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γ(^{40}Ar) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ	Mult.	δ	Comments
		0	0+	3919	60 *4*			
4041		2524	2+	1517	100			
4082	2-,3-	1460.81	2+	2621	100			
4226	4-	3681	3-	545	47 *2*	D+Q	-10 *+3-9*	A_2=-0.10 *3*, A_4=-0.09 *3*. POL=-0.03 *11*.
		2892.60	4+	1333	53 *2*	D(+Q)	+0.6 *+4-8*	A_2=+0.34 *4*, A_4=+0.08 *4*. δ: -1.7 *+13-4* for J=3.
4229		2524	2+	1705	77 *3*			
		1460.81	2+	2768	23 *3*			
4300	1-,2-,3-	1460.81	2+	2839	100			
4328	1,2+	1460.81	2+	2867	71 *5*			
		0	0+	4328	29 *5*			
4420		3208	2+	1212	9 *2*			
		2524	2+	1896	8 *2*			
		1460.81	2+	2959	83 *4*			
4427	3+,4,5+	2892.60	4+	1534	43 *5*	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.
		1460.81	2+	2966	57 *5*			
4473	(1)	0	0+	4473	100			
4494	5-	4226	4-	268	1.8 *3*			
		3515	4+	979	9 *1*			
		3464.48	6+	1030	28 *2*	D(+Q)	+0.06 *+7-10*	A_2=-0.17 *4*, A_4=-0.03 *4*. δ: <-14 is not allowed by RUL.
		2892.60	4+	1601	61 *3*	E1(+M2)	0.00 *+6-9*	A_2=-0.24 *3*, A_4=-0.03 *3*. POL=+0.58 *15*.
4562	1-,2-,3-	4082	2-,3-	480	9 *1*			
		3919	2+	643	42 *4*			
		1460.81	2+	3101	49 *4*			
4578	2+,3	3511	1,2+	1067	35 *4*			
		3208	2+	1370	11 *2*			
		2892.60	4+	1685	38 *4*			A_2=-0.21 *6*, A_4=+0.08 *6*. δ: -0.05 to +0.72 for J=3.
		1460.81	2+	3117	11 *2*			
4602	(1,2,3)-	4328	1,2+	274				Could have escaped detection due to low energy.
		2524	2+	2078	90 *2*			
		1460.81	2+	3141	10 *2*			
4674		1460.81	2+	3213	100			
4769	(1,2+)	0	0+	4769	100			
4794	3+,4+	2892.60	4+	1901	50 *5*	M1+E2		δ: 0.22 *+13-5* or +1.60 *15* for J=4; -1.0 *6* for J=3 A_2=+0.32 *4* A_4=-0.07 *5*.
		1460.81	2+	3333	50 *5*			
4858	5-	4494	5-	364	10.0 *5*			
		3464.48	6+	1394	24 *1*			
		2892.60	4+	1965	66 *2*	E1(+M2)	-0.09 *+8-12*	A_2=-0.43 *4*, A_4=-0.04 *3*, POL=+0.71 *26*.
4929		3681	3-	1248	50 *4*			
		2524	2+	2405	22 *3*			
		1460.81	2+	3468	28 *3*			
4959	(6+)	3515	4+	1444	64 *3*	E2		A_2=+0.30 *3*, A_4=-0.07 *4*.
		2892.60	4+	2066	36 *3*	E2		A_2=+0.29 *5*, A_4=-0.07 *6*.
4972		2892.60	4+	2079	59 *4*			
		1460.81	2+	3511	41 *4*			
4991	4(-)	4226	4-	765	83 *2*	D+Q		A_2=+0.40 *3*, A_4=+0.04 *5*, POL>+0.65.

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ	Mult.	δ	Comments
								δ(Q/D)=-0.13 to +0.77 or -0.72 to -1.5.
		4082	2-,3-	909	9 *1*			
		3681	3-	1310	8 *1*			
5115		3464.48	6+	1651	100			
5143		3515	4+	1628	17 *2*			
		3464.48	6+	1679	83 *2*			
5166		3515	4+	1651	70 *3*			
		1460.81	2+	3705	30 *3*			
5245		1460.81	2+	3784	100			
5269		3681	3-	1588	100			
5293		1460.81	2+	3832	100			
5310		4494	5-	816	11 *1*			
		4082	2-,3-	1228	41 *3*			
		3681	3-	1629	48 *3*			
5350		2892.60	4+	2457	100			
5378		3515	4+	1863	21 *2*			
		3464.48	6+	1914	28 *2*			
		2892.60	4+	2485	51 *4*			
5508		3515	4+	1993	100			
5544		1460.81	2+	4083	100			
5559		3515	4+	2044	26 *2*			
		3464.48	6+	2095	28 *2*			
		2892.60	4+	2666	46 *4*			
5608		1460.81	2+	4147	100			
5611		3464.48	6+	2147	100			
5630		4427	3+,4,5+	1203	100			
5654		2524	2+	3130	100			
5662		2892.60	4+	2769	100			
5675		3681	3-	1994	100			
5766		3208	2+	2558	100			
5818		2892.60	4+	2925	100			
5885		2892.60	4+	2992	53 *4*			
		1460.81	2+	4424	47 *4*			
5912		4082	2-,3-	1830	50 *5*			
		3208	2+	2704	50 *5*			
5931		2892.60	4+	3038	72 *4*			
		1460.81	2+	4470	28 *4*			
5973	(6-)	3464.48	6+	2509	100			
6013	(7-)	4494	5-	1519	50 *3*			
		3464.48	6+	2549	50 *3*			
6099		1460.81	2+	4638	75 *5*			
		0	0+	6099	25 *5*			
6104		2892.60	4+	3211	100			
6138		3464.48	6+	2674	100			
6158		3464.48	6+	2694	87 *2*			
		2892.60	4+	3265	13 *2*			
6185		4494	5-	1691	100			
6203		2892.60	4+	3310	100			
6270		3464.48	6+	2806	100			
6305		3515	4+	2790	60 *5*			
		3464.48	6+	2841	40 *5*			
6356		4858	5-	1498	67 *5*			
		3464.48	6+	2892	33 *5*			
6806	(8+)	4959	(6+)	1847	100			
6979	(8-)	5973	(6-)	1006	$>$80			

† From level-energy differences unless otherwise stated. Measured Eγ values are not available.
[a] From 1975Wa23, the values are either from ^{27}Al(^{18}O,p$\alpha\gamma$) or from (α,pγ).

^{38}Ar(t,p) 1975Fl08

1975Fl08, 1973Ca13: E=20.0 MeV. Measured $\sigma(\theta)$, FWHM=35 keV. Uncertainty in absolute cross sections is 15%.

^{40}Ar Levels

Level	dσ/dΩ (max) mb/sr	θ	Level	dσ/dΩ (max) mb/sr	θ
0	0.28	20.0	5298	0.086	12.5
1461	0.54	12.5	5393	0.040	35.0
2121	0.014	12.5	5454	0.074	12.5
2524	0.006	12.5	5500	0.040	20.0
2892	0.33	20.0	5671	0.056	20.0
3207	0.32	12.5	5835	0.18	20.0
3468	0.068	42.5	5883	0.42	12.5
3507	0.077	12.5	6140	0.032	27.5
3681	0.18	12.5	6305	0.092	12.5
3926	0.18	12.5	6470	0.10	12.5
4053	0.015	27.5	6670	0.018	35.0
4092	weak		6760	0.20	20.0
4310	0.17	12.5	6835	0.077	12.5
4430	0.39	20.0	7070	0.015	35.0
4495	0.021	20.0	7160	0.061	12.5
4665	0.015	27.5	7300	0.089	12.5
4798	0.071	12.5	7495	0.17	12.5
4870	0.024	20.0	7640	0.13	12.5
4968	0.012	27.5	7730	0.12	12.5
5117	0.022	20.0	7890	0.088	12.5
5191	0.024	20.0	7980	0.085	12.5

E(level)†	J^π	L†	Enhancement factor (ε)‡	Comments
0		0	3.5	Summed absolute cross section=0.73 mb/sr (1973Ca13).
1461 *5*		2	2	
2121 *5*			≈0.1&	L: $\sigma(\theta)$ is uncharacteristic of L=0 distribution. Summed absolute cross section=0.02 mb/sr (1973Ca13).
2524 *5*		(2)	0.03	
2892 *5*		(3,4)	1.5#	
3207 *5*		2	1	
3468 *5*		(6)	0.4	
3507 *5*		(2)	0.05	
3681 *5*		3,4	0.9@	
3926 *5*		2	0.8	
4053 *5*			0.06#	
4092 *10*				Weak group.
4310 *10*		2	0.7	E(level): corresponds to 4324, 2+ level, not 4301 in Adopted Levels.
4430 *5*		3,4	3,1.5	
4495 *10*		(5)	0.02	
4665 *10*				
4798 *10*		3,4		
4870 *10*		3,4	0.2@	
4968 *10*				
5117 *15*		(5)	0.02	
5191 *15*				
5298 *15*		2	0.4	
5393 *15*				
5454 *15*		3,4	0.05@	
5500 *15*		3,4	0.04@	
5671 *15*		3,4	0.2#	
5835 *15*		3,4	1.3,0.6	
5883 *15*		2	2	
6140 *15*		(5)	0.03	

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^{40}Ar Levels (continued)

E(level)†	Jπ	L†	Enhancement factor (ε)‡	Comments
6305 *15*				
6470 *15*		(2)		
6670 *15*				
6760 *15*		3,4		
6835 *15*		3,4		
7070 *15*				
7160 *15*				
7300 *15*				
7495 *15*				
7640 *15*		2		
7730 *15*				
7890 *15*				
7980 *15*				

† From 1975Fl08.
‡ ε=(dσ/dΩ)exp/218σ(DWUCK). Form factors used were $f^2_{7/2}$ for most of the levels and $f_{7/2}d_{3/2}$ for some.
# For L=4.
@ For L=3.
& For L=0.

^{38}Ar(α,^{2}He) 1978Ja10

1978Ja10 (also 1978Ja22 and thesis by 1980StZO): E=65 MeV. Measured pp coin, $\sigma(\theta)$, tof. FWHM=300-600 keV.

^{40}Ar Levels

E(level)	Jπ	Relative intensity at θ=13°†	Comments
0	0+‡	7	
1460 *70*	2+‡	15	
2890 *70*	4+‡	30	
3470 *70*	6+‡	100	
8.2×10^3 *8*		60	E(level): broad peak, probably complex structure of many states.
9.0×10^3 *1*		60	

† Estimated intensity, read off the spectrum in figure 6b of 1978Ja10.
‡ From 1978Ja10, member of $f^2_{7/2}$ multiplet; same assignments as in Adopted Levels.

^{40}Ar(γ,γ′),(pol γ,γ′) 1988Mo12,1986Wi08

1988Mo12: (γ,γ′) E=8.5, 10.3, 11.8 MeV. Measured Eγ, Iγ, γ(θ).
1986Wi08: (pol γ,γ′) E=17 MeV bremsstrahlung, measured Eγ, asymmetry. A total of 14 transitions identified.

^{40}Ar Levels

E(level)[†]	Jπ[‡]	Γ[@]	$(2J+1)\Gamma_0^2/\Gamma$ (eV)[#]	Comments
0	0+			
1461	2+			
4473 *3*	1		0.21 *4*[d]	
4768 *1*[c]	1-[a]		2.46 *17*[d]	
4901 *3*			0.05 *2*	
5110 *3*	(1,2+)		0.07 *2*	Jπ: no assignment in Adopted Levels.
5393 *3*	1[b]		0.09 *2*	
5880 *3*	1[b]		0.35 *4*	
5912 *3*	1		0.15 *5*	
6056 *2*[c]	1[&]		1.24 *19*	
6102 *3*	1,2+		0.17 *5*	Γ_0/Γ_γ=0.26.
6340 *2*[c]	1[&b]		0.87 *10*[d]	
6450 *3*			0.17 *4*	
6477 *3*[c]	1[&b]		1.29 *16*[d]	
6703 *3*	1		0.38 *6*	
7168 *3*	1		0.24 *7*	
7246 *3*	1		0.37 *7*	
7281 *3*	1		0.48 *10*	
7519 *3*	1		0.46 *10*	
7626 *3*	1		0.33 *8*	
7708 *3*[c]	1[&]		2.2 *3*	
7918 *2*[c]	1[&]		1.84 *24*	
7993 *3*[c]	1[&]		0.78 *14*	
8032 *3*	1,2+		1.13 *20*	
8163 *2*[c]	1-[a]		5.7 *10*	
8191 *3*[c]	1[&]		2.2 *2*	
8303 *3*	1		1.14 *19*	
8552 *3*	1		1.66 *18*	
8585 *3*[c]	1[&]		2.6 *4*	
8644 *3*	1		0.80 *21*	
8676 *3*	1,2+		1.8 *7*	
8884 *3*[c]	1[&]		2.5 *4*	
8917 *3*	1[b]	0.34 eV *14*[e]	0.81 *21*	
9128 *3*	1[b]	0.71 eV *14*	1.8 *3*	
9337 *3*	1,2+[b]		0.76 *18*	
9356 *3*	1[b]	1.0 eV *3*	0.96 *24*	Γ_0/Γ_γ=0.87.
9416 *3*	1[b]	3.4 eV *18*	1.2 *6*	
9502 *2*[c]	1(-)[a]	7.9 eV *13*	13.8 *12*	Γ_0/Γ_γ=0.89.
9582 *3*	1[b]	7.3 eV *21*	0.99 *25*	E(level): doublet: 9580+9585. Γ_0/Γ_γ=(0.41).
9757 *3*	1[b]	0.56 eV *22*[e]	1.5 *3*	
9840 *3*	1		4.0 *10*	
9850 *2*[c]	1-[a]	21 eV *4*	13.4 *20*	E(level): doublet: 9848+9851. Γ_0/Γ_γ=0.47.
9950 *3*	1[b]	10 eV *3*	0.95 *26*	Γ_0/Γ_γ=0.71.
10090 *3*	1		1.4 *3*	
10151 *3*	1		3.4 *5*	
10179 *2*[c]	1[&]		4.5 *6*	
10362 *3*	1,2+		1.5 *4*	
10745 *3*	1		1.6 *3*	
10857 *3*	1		1.7 *4*	

[†] From 1988Mo12, unless otherwise stated.

‡ From $\gamma\gamma(\theta)$ data of 1988Mo12, unless otherwise stated. For most levels, $\gamma\gamma(\theta)$ data agree with those expected for 0-1-0 cascade.
# From 1988Mo12, J=spin of excited state.
@ Deduced by 1988Mo12 from their $(2J+1)\Gamma_0^2/\Gamma$ values, and $S(\alpha,\gamma)=(2J+1)\Gamma_\alpha/\Gamma$ and Γ_0/Γ_γ from 1986Jo09.
& 1986Wi08 give 1,2+.
a Parity from polarization asymmetry from 1986Wi08.
b 1- or 1(-) in Adopted Levels.
c From average of 1988Mo12 and 1986Wi08.
d For Γ_0/Γ_γ=1.
e Lower limit using Γ_0/Γ_γ=1.

$\gamma(^{40}Ar)$

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	Mult.
1461	2+	0	0+	1461	
4473	1	0	0+	4473 *3*	
4768	1-	0	0+	4768 *1*	
4901		0	0+	4901 *3*	
5110	(1,2+)	0	0+	5110 *3*	
5393	1	0	0+	5393 *3*	
5880	1	0	0+	5880 *3*	
5912	1	0	0+	5912 *3*	
6056	1	0	0+	6056 *2*	
6102	1,2+	1461	2+	4638 *3*	
		0	0+	6102 *3*	
6340	1	0	0+	6339 *2*	
6450		0	0+	6450 *3*	
6477	1	0	0+	6477 *3*	
6703	1	0	0+	6703 *3*[ba]	
7168	1	0	0+	7168 *3*	
7246	1	0	0+	7246 *3*	
7281	1	0	0+	7281 *3*	
7519	1	0	0+	7519 *3*	
7626	1			6168 *3*	
		0	0+	7626 *3*	
7708	1	0	0+	7708 *3*	
7918	1	0	0+	7918 *2*	
7993	1	0	0+	7993 *3*	
8032	1,2+	1461	2+	6570 *3*	
		0	0+	8032 *3*	
8163	1-	1461	2+	6703 *2*[b]	
		0	0+	8163 *2*	E1
8191	1	0	0+	8191 *3*	
8303	1	0	0+	8303 *3*	
8552	1	0	0+	8552 *3*	
8585	1	0	0+	8585 *3*	
8644	1	0	0+	8644 *3*	
8676	1,2+	0	0+	8676 *3*	
8884	1	0	0+	8884 *3*	
8917	1	0	0+	8917 *3*	
9128	1	0	0+	9128 *3*	
9337	1,2+	0	0+	9337 *3*	
9356	1	0	0+	9356 *3*	
9416	1	0	0+	9416 *3*	
9502	1(-)	0	0+	9502 *2*	
9582	1	0	0+	9582 *3*	
9757	1	0	0+	9757 *3*	
9840	1	0	0+	9840 *3*	
9850	1-	0	0+	9850 *2*	
9950	1	0	0+	9950 *3*	
10090	1	0	0+	10090 *3*	
10151	1	0	0+	10151 *3*	

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	Mult.
10179	1	0	0+	10179 *2*	
10362	1,2+	0	0+	10362 *3*	
10745	1	0	0+	10745 *3*	
10857	1	0	0+	10857 *3*	

[a] In table I of 1988Mo12 6703γ is shown to deexcite only the 8162 level, but in authors′ table II, 6703 level is also given.
[b] Multiply placed.

^{40}Ar(e,e′) 1977Fi09,1975GrYY

Includes (e,e).
1977Fi09, 1976Fi12 (also thesis by 1976FiZW): (e,e′) E=65-115 MeV. Measured $\sigma(\theta)$, deduced form factors, widths and rms radii.
1975GrYY: (e,e′). Measured σ, deduced levels and form factor.
1982Ot01: (e,e) E=116, 249 MeV. Measured $\sigma(\theta)$, deduced rms radii.
1975Ch41: (e,e′) E=150-165 MeV. Measured σ(E), deduced giant-resonance structure.
1974We02: (e,e) E=248 MeV. Measured $\sigma(\theta)$, deduced rms radii.
1971Sc09: (e,e) E=40-57 MeV. Measured $\sigma(\theta)$, deduced rms radii.
1971Gr27: (e,e) E=78-120 MeV. Measured $\sigma(\theta)$, deduced rms radii, form factors.
1963Go04: (e,e) E=41 MeV.
1963Ba19: (e,e′).
1956He83: (e,e′) E=187 MeV, $\sigma(\theta)$ data for g.s., 1460 and 2400 levels.
B(E2)′s are those deduced by 1977Fi09 using Tassie′s model. 1977Fi09 also give values using Helm′s model.

^{40}Ar Levels

E(level)	J^{π}†	$T_{1/2}$‡	BEL (W.u.)‡	Comments
0	0+			$<r^2>_{1/2}$=3.393 fm *15* (1976Fi12), 3.41 fm *4* (1971Sc09), 3.47 fm *5* (1971Gr27,1975GrYY), 3.48 fm *4* (1974We02).
1460	2+	1.12 ps *4*	9.4 *3*	B(E2)=0.0382 *13* (1977Fi09).
2520	2+	194 fs *35*	1.6 *3*	B(E2)=0.0063 *11* (1977Fi09). $T_{1/2}$: 0.23 ps *4* (1956He83). β_2=0.025 *5* (1956He83).
3210	2+	35 fs *7*	0.72 *10*	B(E2)=0.0029 *4* (1977Fi09). Jπ: 2+ is supported by $\sigma(\theta)$ data of 1977Fi09.
3510#				
3680	3-		13.2 *15*	B(E3)=0.0087 *10* (1977Fi09).
3920#				

† From adopted level.
‡ Deduced from B(E2)′s and adopted branching ratios.
# From 1975GrYY only.

^{40}Ar(n,n′γ) 1965Ma41

1965Ma41 (also 1966Ma10): E=3-4.5 MeV. Measured $\gamma(\theta)$.

^{40}Ar Levels

E(level)	J$^{\pi\dagger}$	Comments
0	0+	
1450	2+	
2130	0+	
2530	2+	
3220	2+	E(level): 3208 in Adopted Levels.

† From Adopted Levels.

$\gamma(^{40}$Ar)

A_2 values are read (by evaluators) from $\gamma(\theta)$ plots in 1965Ma41.

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	Comments
1450	2+	0	0+	1450	A_2=+0.18 *4*.
2130	0+	1450	2+	680	A_2=0.0 *1*.
2530	2+	1450	2+	1080	A_2=-0.07 *7*.
		0	0+	2530	A_2=+0.33 *7*.
3220	2+	1450	2+	1770	A_2=+0.42 *4*.

^{40}Ar(p,p′),(pol p,p′) 1988Bl04,1985De03,1961Ka26

Includes (p,p), (pol p,p).
1988Bl04: (p,p′) E=0.8 GeV. Measured $\sigma(\theta)$. FWHM=140 keV.
1985De03: (p,p′) E=29.6, 35.1 MeV. Measured $\sigma(\theta)$. FWHM=80-120 keV. Deduced BEL values.
1961Ka26: (p,p′) E=8 MeV, 23 levels reported with precise energies.
Others:.
1992Go18: (p,p) E=1.875-1.879 MeV. Measured yield.
1983Ba01: (p,p′) E=1 GeV. Measured total σ.
1983Ok01: (pol p,p) E=25.1, 32.5, 40.7 MeV. Measured Ay(θ).
1982Sa19, 1982Sa37, 1979Sa38, 1978Sa33: (pol p,p) E=65 MeV. Measured Ay(θ).
1980Fa06, 1980Fa07: (p,p) E=20.9-44.1 MeV. Measured $\sigma(\theta)$.
1977Bi09: (p,p) E=1.093, 0.992 MeV. Measured σ
1973Be41: (pol p,p) E=40 MeV. Measured Ay(θ).
1971Ru04: (pol p,p′) E=49.4 MeV. Measured $\sigma(\theta)$, Ay(θ). Five levels at 1460, 2530, 2910, 3230 and 3710 studied.
1969Ba23: (pol p,p) E=21 MeV. Measured $\sigma(\theta)$, Ay(θ).
1968Jo14: (p,p′) E=24.85 MeV. Measured $\sigma(\theta)$.
1966Hu05, 1966Hu12: (p,p′) E=4.1, 7.3 MeV. Measured $\sigma(\theta)$.
1965Gr11: (p,p′) E=14.1, 16.9 MeV. Measured $\sigma(\theta)$.
1964Bo27: (pol p,p) E=14.5 MeV. Measured $\sigma(\theta)$.
1962Ta05: (p,p′) E=6.14 MeV. Measured $\sigma(\theta)$ for three levels.
1962An04: (p,p′) E=14.8 MeV.
1961Ba29: (p,p′) E=0.8-3.5 MeV. Measured $\sigma(\theta)$.
1961Be32: (p,p′) E=7.3, 9.4 MeV, 21 levels reported
1961Ro13, 1961Ro05: (pol p,p) E=8, 10 MeV. Measured $\sigma(\theta)$.
1961Co29: (p,p) E=1-2 MeV.
1960Od01: (p,p′) E=7.6-14.2 MeV. Measured $\sigma(\theta)$ for g.s. and 1460 peak. Two other peaks seen at 3700 and 4800.
1958Ty47: (p,p′) E=185 MeV. Measured $\sigma(\theta)$.
1957Gi14: (p,p′) E=9.5 MeV.
1956Ei15: (p,p′) E=8.5, 9.0, 9.8 MeV. Measured $\sigma(\theta)$.
1956Va28: (p,p′).
1956Bu95: (p,p) E=9.5 MeV.
1956Ki54: (p,p) E=14.5, 20, 31.5 MeV. Measured $\sigma(\theta)$.

1954Fr43: (p,p′) E=9.5 MeV. Measured $\sigma(\theta)$.
1947He02: (p,p′) E=9.2 MeV, levels reported at 1500 and 2400.

^{40}Ar Levels

B(EL) values from 1985De03 correspond to different nuclear models (rotational or vibrational) and to different choice of low-lying levels in coupled-channel (CC) calculations. Known gamma-ray branching ratios and lifetimes were used in the analysis. The negative sign for some of these values is that of the corresponding matrix element. See full details in 1985De03.

Multiple values of deformation parameters and transition probabilities (BE(L)) arise from choice of different nuclear models and to selection of low-lying levels used in the analysis.

E(level)[†]	Jπ[@]	L[&]	β_LR[a]	Comments
0	0+	0		
1462 *2*	2+	2	0.95	β_2=0.242 *5* or 0.220 *4* (1985De03), 0.24 *2* or 0.26 *2* (1971Ru04), 0.21 (1968Jo14). B(E2)(from g.s.)=0.046 *8*, 0.0459 *19*, 0.0448 *20*, 0.0430 *10*, 0.0441 *10*, 0.0447 *10* (1985De03).
2125 *3*	0+	0		L: ≤2 (1965Gr11). β_1=0.05 for L=1 (1968Jo14). β_0=0.032 *8* or -0.029 *8* (1985De03). B(E2)(from 1460,2+)=0.0046 *17*, 0.00078 *14*, 0.00014 *4* (1985De03).
2529 *3*	2+	2	0.28	L: ≤(0),1 (1965Gr11). β_2=0.33 *3* (1985De03), 0.05 (1968Jo14). B(E2)(from g.s.)=0.0039 *7*, 0.00350 *2*, 0.0024 *2* (1985De03). B(E2)(from 1460,2+)=0.0011 *2*, 0.00013 *11*, 0.00006 *14* (1985De03). B(E4)(from 1460,2+)=0.0000048 *12*, 0.000079 *8*, 0.000047 *41* (1985De03). B(E2)(from 2120,0+)=0.097 *9*, 0.23 *4* (1985De03).
2897 *5*	4+	4	0.32	β_4=0.107 *12* or 0.078 *7* (1985De03), 0.11 (1968Jo14). B(E4)(from g.s.)=0.00113 *6*, 0.00077 *11*, 0.00080 *5* (1985De03). B(E2)(from 1460,2+)=0.024 *4*, 0.0040 *1*, 0.0054 *22*, 0.014 *4* (1985De03). B(E4)(from 1460,2+)=0.000294 *13*, 0, 0.00063 *37*, 0.00005 *9* (1985De03).
3213 *5*	2+	2	0.22	β_2=0.07 (1968Jo14). B(E2)(from g.s.)=0.0010 *3* (1985De03). B(E2)(from 1460,2+)=0.0014 *5* (1985De03). B(E4)(from 1460,2+)=0.00040 *34* (1985De03).
3518 *5*	(2+)	(2)	0.17	β_3=0.07 for L=3 (1968Jo14). E(level): complex structure (1988Bl04), known levels at 3512, 4+ and 3464, 6+ may be included in the peak at 3510. The angular distribution (in 1988Bl04) for 3510 does not agree with that expected for L=2.
3688 *5*	3-	3	1.00	β_3=0.26 *3* (1985De03,1968Jo14), 0.29 *2* or 0.31 *2* (1971Ru04). B(E3)(from g.s.)=0.0150 *5* (DWBA), 0.0165 *3* (CC) (1985De03). B(E2)(from 1460,2+)=0.0038 *10* (1985De03). B(E5)(from 1460,2+)=0.000035 *17* (1985De03).
3926 *6*	2+	2	0.22	β_2=0.07 (1968Jo14). B(E2)(from g.s.)=0.0024 *2* (1985De03). B(E2)(from 1460,2+)=0.0065 *29* (1985De03). B(E4)(from 1460,2+)=0.00105 *17* (1985De03).
4053 *7*				
4092 *7*				
4240 *7*				
4310 *7*	(2+,3-)	(2,3)		L: from 1968Jo14. Jπ: (1,3)- in Adopted Levels. β_2=0.07, β_3=0.08 (1968Jo14).
4348 *11*				
4430 *7*	3-	3	0.44	L: 2 (1965Gr11). Jπ: (0+:4+) and (4+) in Adopted Levels. β_4=0.19 for J=4 (1968Jo14).
4484 *8*				
4581 *7*				
4612 *9*				

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^{40}Ar Levels (continued)

E(level)[†]	Jπ[@]	L[&]	$\beta_L R$[a]	Comments
4683 *10*				
4775 *10*				
4808 *10*				
4880 *9*		(4)		L: from 1965Gr11, (2,3,4) in 1968Jo14.
4941 *10*				
5004 *12*				
5280 *20*[‡]				
5410	(5-)	(5)	0.24	L: 0.22 for L=4. Jπ: 1- in Adopted Levels.
5460 *20*[‡]				
5695 *33*[#]				
5900 *20*[‡]	3-	3	0.32	β_4=0.10 for L=4.
6130 *20*[‡]	(2+)	(2)	0.22	β_2=0.08 (1968Jo14). Jπ: no assignment in Adopted Levels. L: 0.25 for L=3 (1988Bl04).
6270 *33*[#]				
6475 *42*[#]				
6650 *24*[#]				
7300 *20*[‡]				

[†] From 1961Ka26, unless otherwise stated. The values seem to be systematically higher by about 10 keV as compared to the precisely known values in Adopted Levels.
[‡] From 1968Jo14.
[#] From 1961Be32.
[@] From L values.
[&] From 1988Bl04, unless otherwise stated.
[a] From 1988Bl04, R=$r_0A^{1/3}$, where A=40.

^{40}Ar(p,p′γ) 1976So05,1976So03

1976So05: E=6.75 MeV. Measured Eγ, Iγ, pγ coin, pγ(θ).
1976So03: E=6.75 MeV. Measured pγ coin, lifetimes by Doppler-shift attenuation method (DSA).
1979Be41: E=5.75 MeV. Measured lifetimes by DSA of 1461, 2524 and 3209 levels.
1976So05, 1976So03 and 1979Be41 are from the same group.
Others:.
1974Be62: E=3.74 MeV. Measured σ(θ), pγ(θ).
1972He04 (also thesis by 1971HeZQ): E=5.3 MeV; measured lifetime of 2121, 0+ level.
1971Pl04: E=4.7-5.8 MeV. Measured γγ(θ), pγ(θ).
1966Hu05, 1966Hu12: E=4.1, 7.3 MeV. Measured pγ(θ).
1962Wa26: E=5.1 MeV. Measured Eγ, Iγ, γγ(θ), levels reported at 1450, 2130, 2530, 2900, 4300 and 4590.
1961Ba29: E=0.8-3.5 MeV.
1959Ho96: E=4 MeV. Three γ rays reported in ^{40}Ar.
A 4590 level with γ rays to 2530 and 2900 levels reported by 1962Wa26 has not been included here due to lack of confirmation in more recent studies.

^{40}Ar Levels

E(level)	Jπ[†]	$T_{1/2}$[‡]	Comments
0	0+		
1461	2+	1.35 ps *10*	$T_{1/2}$: other: 0.72 ps *+80-28* (1979Be41).
2121	0+	104 ps *14*	Jπ: from γγ(θ) (1962Wa26). $T_{1/2}$: from pγ(t) (1972He04). Other: >17 ps (1976So03). Iγ<3 for decay to g.s.
2524	2+	0.37 ps *4*	$T_{1/2}$: other: 0.24 ps *7* (1979Be41).
2893	4+	3.0 ps *+18-9*	Jπ: (3-,4+) (1976So05). Iγ<2 for decay to g.s. and 2121 levels.

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^{40}Ar Levels (continued)

E(level)	J^{π}†	$T_{1/2}$‡	Comments
3208	2+	<24 fs	$T_{1/2}$: other: <21 fs (1979Be41).
3511	2+	83 fs *31*	
3681	3-	0.10 ps *+6-5*	
3919	2+	0.30 ps *4*	
4042 *2*			
4084 *2*	3-		
4230 *2*			E(level): two separate levels near this energy in Adopted Levels: one deexcited by 545 and 1333 gammas, and the other by 1705 and 2768 gammas.
4301 *2*	(1,3)-		
4419 *3*			
4484 *8*	1-	<0.07 ps	

† From Adopted Levels.
‡ From DSA (1976So03).

γ(^{40}Ar)

A_2 and A_4 are from 1976So05.

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ	I_γ‡	Mult.	δ†	Comments
1461	2+	0	0+	1461	100	E2		A_2=+0.40 *2*, A_4=-0.42 *3*.
2121	0+	1461	2+	660	100			A_2=-0.03 *3*, A_4=-0.04 *4*.
2524	2+	2121	0+	403	<1			
		1461	2+	1063	59 *2*	M1+E2	-0.41 *+6-13*	I_γ: 55 *5* (1971Pl04). A_2=-0.09 *4*, A_4=-0.04 *5*. δ: other: -0.24 (1971Pl04).
		0	0+	2524	41 *2*	E2		I_γ: 45 *5* (1971Pl04). A_2=+0.53 *5*, A_4=-0.43 *8*.
2893	4+	2524	2+	369	2 *2*			I_γ: from 1971Pl04. I_γ<1 (1976So05).
		1461	2+	1432	98 *3*	E2		I_γ: from 1971Pl04. I_γ=100 (1976So05). δ(O/Q)=-0.08 *7* from A_2=+0.37 *3*, A_4=-0.19 *5*.
3208	2+	2893	4+	315	2 *2*			I_γ: from 1971Pl04. I_γ<1 (1976So05).
		2524	2+	684	<2			
		2121	0+	1087	2 *2*			I_γ: from 1971Pl04. I_γ<2 (1976So05).
		1461	2+	1747	91 *3*	M1+E2	+0.11 *7*	I_γ: 84 *2* (1971Pl04). A_2=+0.47 *2*, A_4=-0.06 *4*. δ: other: +0.20 for J=2, 0 for J=1 (1971Pl04).
		0	0+	3208	9 *3*			I_γ: 12 *5* (1971Pl04).
3511	2+	3208	2+	303	2 *2*			I_γ: from 1971Pl04. I_γ<3 (1976So05).
		2893	4+	618	2 *2*			I_γ: from 1971Pl04. I_γ<5 (1976So05).
		2524	2+	987	<5			
		2121	0+	1390	<5			
		1461	2+	2050	89 *2*	M1(+E2)	-0.05 *11*	I_γ: 84 *2* (1971Pl04). A_2=+0.34 *7*, A_4=+0.04 *8*. δ: for J=2.
		0	0+	3511	11 *2*			I_γ: 12 *5* (1971Pl04).
3681	3-	3511	2+	170	<7			
		3208	2+	473	<10			
		2893	4+	788	15 *3*			I_γ: 24 *6* (1971Pl04).
		2524	2+	1157	6 *3*			I_γ: from 1971Pl04. I_γ<6 (1976So05).

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γ(^{40}Ar) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	I_γ‡	Mult.	δ†	Comments
		2121	0+	1560	<5			
		1461	2+	2220	85 *3*	E1(+M2)	-0.07 *+5-11*	I_γ: 70 *3* (1971Pl04). A_2=-0.43 *8*, A_4=+0.08 *10*.
		0	0+	3681	<5			
3919	2+	3681	3-	238	<2			
		3511	2+	408	<2			
		3208	2+	711	<2			
		2893	4+	1026	<2			
		2524	2+	1395	8 *1*			
		2121	0+	1798	12 *2*			
		1461	2+	2458	21 *3*	M1+E2		A_2=-0.18 *9*, A_4=+0.02 *13*. δ: <-0.3 or >+6.
		0	0+	3919	59 *3*	E2		A_2=+0.47 *8*, A_4=-0.27 *13*.
4042		2893	4+	1149	<10			
		2524	2+	1518 *2*	60 *13*			
		2121	0+	1921	<10			
		1461	2+	2581	40 *13*			
		0	0+	4042	<10			
4084	3-	2893	4+	1191	<10			
		1461	2+	2623 *2*	100			
		0	0+	4084	<10			
4230		3681	3-	547 *2*	31 *5*			
		3511	2+	719	<10			
		3208	2+	1022	<10			
		2893	4+	1338 *2*	32 *5*			A_2=+0.63 *14*, A_4=+0.17 *19*.
		2524	2+	1708 *2*	37 *5*			A_2=+0.50 *15*, A_4=+0.23 *19*.
		2121	0+	2109	<15			
		1461	2+	2769	<10			
		0	0+	4230	<10			
4301	(1,3)-	1461	2+	2840 *2*	100			A_2=+0.24 *9*, A_4=-0.15 *13*.
4419		2524	2+	1895	20 *10*			
		2121	0+	2298	<15			
		1461	2+	2958 *3*	80 *10*			
4484	1-	2121	0+	2363	<10			
		1461	2+	3023	<10			
		0	0+	4484	100	D		A_2=-0.29 *5*, A_4=-0.10 *7*.

† From 1976So05.
‡ From 1976So05, unless otherwise stated. Values from 1971Pl04 are given under comments.

^{40}Ar(pol d,d′),(d,d′) 1976Se09

Includes (pol d,d) and (d,d).
1976Se09: (pol d,d′) E=14.83 MeV. Measured $\sigma(\theta)$, vector analyzing power, DWBA and coupled-channel analyses, FWHM=110 keV. Uncertainty in measured cross sections is 15%.
Others:.
1987Nu01: (pol d,d′) E=52 MeV. Measured vector analyzing powers for g.s. and first 2+ state.
1980Ha14: (pol d,d) E=56 MeV. Measured $\sigma(\theta)$, vector and tensor analyzing powers.
1980Ma10: (pol d,d) E=52 MeV. Measured $\sigma(\theta)$, vector analyzing power.
1978Bu22: (pol d,d) E=9.0, 10.75, 12.0 MeV. Measured $\sigma(\theta)$, vector analyzing power.
1975Ca24: (d,d) E=1.5-2.3 MeV. Measured $\sigma(\theta)$.
1970Fi01: (d,d) E=11.8 MeV. Measured $\sigma(\theta)$, deduced optical- model parameters.
1968Hi09: (d,d′) E=52 MeV. Measured $\sigma(\theta)$, DWBA analysis for g.s., first 2+ and first 3- states.
1965Ja13: (d,d′) E=10.6 MeV. Measured $\sigma(\theta)$. All states up to 3681 seen, except the 2121 level.

^{40}Ar Levels

E(level)†	Jπ‡	L	BL (DWBA)	Comments
0	0+	0		
1461	2+	2	0.215	β_2(CCBA)=+0.182. β_2=0.22-0.25 (1968Hi09). β_2=+0.17 or -0.20; β_4=+0.10 (1987Nu01). Coupling parameter β_{02}=0.17 (1987Nu01).
2121	(0+)	(0)		
2524	2+	2	0.077	β_2(CCBA)=-0.075.
2893	4+	4	0.110	β_4(CCBA)=+0.130.
3208	(2+)	(2)	0.118	β_2(CCBA)=+0.126.
3511	2+	2	0.076	
3681	3-	3	0.225	β_3(CCBA)=+0.203. β_3=0.21-0.25 (1968Hi09).
3919#	2+#		0.079#	
3942#	2+#	2	0.079#	
4423	(2+)	(2)	0.153	
4873	3-	3	0.115	
5880	(3-)	(3)	0.094	
6054	4+	4	0.095	

† Rounded-off values from Adopted Levels.
‡ From L values. The assignments are the same in adopted levels, except for parentheses on some of the values.
# For 3919+3942 unresolved doublet.

^{40}Ar(^{3}He,^{3}He′) 1960Ag04

Includes (^{3}He,^{3}He).
$\sigma(\theta)$ measured in all studies
1960Ag04: (^{3}He,^{3}He′) E=28.5 MeV.
1975Br26: (^{3}He,^{3}He) E=26.5 MeV.
1973Mo13: (^{3}He,^{3}He) E=28 MeV.
1969Zu02: (^{3}He,^{3}He) E=15 MeV.

^{40}Ar Levels

E(level)	Jπ
0	0+
1460	2+

^{40}Ar(α,α') **1979Da12,1970Wa17**

Includes (α,α).
1979Da12: (α,α') E=12-15 MeV. Measured $\sigma(\theta)$, FWHM=30-35 keV.
1970Wa17: (α,α') E=21.5, 22.2 MeV. Measured $\sigma(\theta)$, DWBA analysis, FWHM=140 keV.
Others:.
1979Di03: (α,α') E=172.5 MeV. Measured $\sigma(\theta)$, deduced GQR, DWBA analysis, $\sigma(\theta)$ for g.s. and first 2+ also measured.
1976Yo02, 1975Mo04: (α,α') E=96 MeV. Measured $\sigma(\theta)$, deduced GQR, $\sigma(\theta)$ for g.s. and first 2+ also measured.
1976Be31: (α,α) E=104 MeV. Deduced nuclear parameters.
1972Oe01: (α,α) E=24, 29 MeV. Measured $\sigma(\theta)$, deduced back-angle enhancement and shell structure effects.
1970Bu25 (also 1970Iv04,1967Iv02): (α,α') E=13-17 MeV. Measured $\sigma(\theta)$, deduced optical-model parameters.
1969Ha14: (α,α) E=104 MeV. Measured $\sigma(\theta)$, deduced optical potentials, phase shifts.
1969Ga22: (α,α) E=18-29 MeV. Measured $\sigma(\theta)$.
1966Lu02: (α,α') E=18 MeV. Deduced optical-model parameters.
1964La14: (α,$\alpha'\gamma$) E=19.6 MeV. Measured $\sigma(\theta)$.
1959Ya01: (α,α') E=40 MeV.
1958Se51: (α,α') E=18 MeV.

^{40}Ar Levels

E(level)[†]	Jπ[@]	L[d]	BL[e]	Comments
0	0+[&]	0		
1461[‡]	2+[&c]	2	0.16	β_2R=0.87, B(E2)(W.u.)=6.7 *20* (1976Yo02).
2121[‡]	0+[&c]	0	0.014	
2524[‡]	2+[&c]	2	0.05	
2893[‡]	4+[&c]	4		
3208[‡]	(1-)[&c]	(1)	0.05	Jπ: L=1 (1970Wa17) disagrees with Jπ=2+ in Adopted Levels.
3464	NATURAL			
3511	(2+,1-)[&b]			E(level): 3560 in 1970Wa17 is in disagreement.
3681[‡]	3-[&c]	3	0.16	
3919[‡#]	NATURAL			
3942[#]	NATURAL			
4041	NATURAL			Jπ: 0+,1-,2+,3-,4+ (1979Da12).
4082	NATURAL			
4229	3+[ab]			
4300[‡]	NATURAL			
4324	NATURAL			
4341[#]	NATURAL			
4358[#]	NATURAL			
4420[‡]	NATURAL			
4481	1-[&b]			
4562	NATURAL			
4580	NATURAL			
4612[‡]				
4683	UNNATURAL			
4769	NATURAL			
4808	NATURAL			
4880[‡]	NATURAL			
4942	NATURAL			
5004	NATURAL			
5166	(2+)[&b]			
5269	NATURAL			
5310[‡]	NATURAL			
5400	NATURAL			
5465				
5515	NATURAL			
5575	NATURAL			
5608[#]	(NATURAL)			
5630[‡#]	(NATURAL)			
5671	NATURAL			

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^{40}Ar Levels (continued)

E(level)[†]	Jπ[@]	L[d]	BL[e]	Comments
5718				
5880	NATURAL			
5906[‡]	NATURAL			
5950				
6053	NATURAL			
6140[‡]				
6208	NATURAL			
17.7×10^3 *2*		2		E(level): isoscalar giant quadrupole resonance with FWHM=6900 *600* from 1979Di03. Other: 17600 *300* with FWHM=4700 *300* (1976Yo02). L: from 1979Di03 and 1976Yo02. Small admixtures of L=4 and L=0 are not excluded (1979Di03).

[†] Rounded-off value from Adopted Levels for the groups reported by 1979Da12.
[‡] Group reported by 1970Wa17 also.
[#] 3919+3942, 4341+4358 and 5608+5630 are unresolved peaks.
[@] Natural/unnatural parity state from 1979Da12.
[&] Natural parity state (1979Da12).
[a] Unnatural parity state (1979Da12).
[b] From 1979Da12.
[c] From L-value of 1970Wa17.
[d] From 1970Wa17.
[e] From 1970Wa17.

Coulomb excitation 1998Ib01,1992Cu04,1970Na05

1998Ib01: ^{197}Au(^{40}Ar,^{40}Ar′) E=37.4-48.2 MeV/nucleon. Measured Eγ, Iγ, integrated cross section, deduced B(E2).
1992Cu04: ^{208}Pb(^{40}Ar,^{40}Ar′) E=12.5 MeV/nucleon. Measured γ(θ,H) in polarized gadolinium, (particle)γ coin, deduced g factor.
1970Na05: ^{130}Te(^{40}Ar,^{40}Ar′) E=110-125 MeV. Measured B(E2) and quadrupole moment of first 2+ state by reorientation effect.
1965Gu10: ^{27}Al(^{40}Ar,^{40}Ar′) E=48 MeV. Measured B(E2) for first 2+ level.
Other:.
1995Gr25: ^{40}Ar(^{62}Ni,^{62}Ni′) E=150 MeV. Measured Eγ, Iγ. Deduced content of ^{40}Ar in target.

^{40}Ar Levels

E(level)	Jπ	Comments
0	0+	
1461	2+	g=-0.1 *1* (1992Cu04). Q=+0.01 *4* (1970Na05). B(E2)=0.037 *7* (1998Ib01), 0.032 *5* (1970Na05), 0.049 *10* (1965Gu10). Jπ: from Adopted Levels.

^{40}Ca(^{14}C,^{14}O) 1980Dr09

1980Dr09: E=51 MeV. Measured $\sigma(\theta)$, DWBA analysis.

^{40}Ar Levels

E(level)	$J^{\pi\ddagger}$	$d\sigma/d\Omega$ (μb/sr)†
0	0+	8.5 *8*
1460	2+	7.5 *5*

† At 15°, read off (by the evaluators) from $\sigma(\theta)$ plot.
‡ From Adopted Levels.

^{41}K(d,^{3}He) 1983Bh03

Jπ(^{41}K g.s.)=3/2+.
1983Bh03: E=22.8 MeV. Measured $\sigma(\theta)$, DWBA analysis. FWHM=140 keV.

^{40}Ar Levels

E(level)	$J^{\pi\dagger}$	L	$C^2S^{\ddagger}$
0	0+	2	0.43
1450 *30*	2+	2	0.72
2510 *30*	2+	0+2	0.02,0.11
3210 *30*	2+	0+2	0.28,0.18
3520 *30*	2+	2	0.66
4360 *30*	2+	0	0.39
4530 *30*			
5200 *30*	(2,3,4)+	0	0.35
5820 *30*			
6230 *30*			

† From Adopted Levels.
‡ 1990En08 give S values, C^2=0.80.

^{42}Ca(^{14}C,^{16}O) 1980Ma40

1980Ma40: E=78 MeV.

^{40}Ar Levels

E(level)†	$J^{\pi\ddagger}$	Comments
0	0+	
1500	2+	
2130		Very weak.
3200		
4300		
4700		
5300		

† Values were read off (by the evaluators) ^{16}O spectrum shown by 1980Ma40, uncertainty is estimated as 100 keV.
‡ From Adopted Levels for first two levels, the others are expected to be 2+ states.

^{44}Ca(^{3}He,^{7}Be) 1976St11

1976St11: E=70 MeV. Measured $\sigma(\theta)$, FWHM=140 keV.

^{40}Ar Levels

E(level)	$J^{\pi\dagger}$	S
0	0+	0.015
1460	2+	
2120	0+	
2520	2+	
2890	4+	
3210	1,2+‡	
3510	1,2+‡	
3680	3-	

† As given by 1976St11.
‡ 2+ in Adopted Levels.

^{44}Ca(α,2α) 1976Sh02

1976Sh02: E=90 MeV. Measured integrated cross section. FWHM=250-300 keV.

^{40}Ar Levels

E(level)	$J^{\pi\dagger}$	Integrated σ (mb/sr^2)
0	0+	0.58 *12*
1440 *50*	2+	0.027 *32*
2090 *90*	0+	0.052 *34*
4000 *40*‡		0.080 *44*
5750 *70*‡		0.026 *25*

† From Adopted Levels.
‡ Composite of several levels.

Adopted Levels, Gammas

Q(β^-)=1311.07 *11*; S(n)=7799.51 *7*; S(p)=7582 *5*; Q(α)=-6438.26 *20* 2003Au03
Other reactions:.
^{40}K(α,α') E=24, 29 MeV: 1972Oe01, measured $\sigma(\theta)$.
^{41}K(^{3}He,α) E=24 MeV: 1973DeWO.
^{41}K(^{3}He,$\alpha\gamma$) E=12.5 MeV: 1977McZQ: measured $\alpha\gamma$ coin, deduced three levels in ^{40}K near 4384 with T=2, IAS.
^{45}Sc(p,^{6}Li) E=45 MeV: 1970BeYK: measured $\sigma(\theta)$ for g.s. and some other unresolved structures which are strongly forward peaked.
Hyperfine structure, isotope-shifts, moments, etc. (measurements): 1997Si24, 1982Pe14, 1982Du19, 1981Le19, 1976Bo21, 1974Sa24, 1974Br12, 1972Jo09, 1969Jo06, 1968Ne05.
In XREF column, level population indicated by letter O or o refers to the following level energies in different reactions:.
^{40}K(γ,γ): Mossbauer: 0, 29.8.
^{40}Ca(pol d,2p),(d,2p): 0, 800, 2300.
^{40}Ca(^{7}Li,^{7}Be): 0, 30, 850, 1960, 2270, 7000, 11000 (analog of GDR in ^{40}Ca).
^{40}Ca(^{12}C,^{12}N),(^{13}C,^{13}N): 0, 30, 740, 890 and giant resonances at 11 and 12.0 MeV.
^{41}K(n,2n),(n,2nγ): 0, 30, 850, 1640.
^{40}Ca(p,^{3}He): 0, 1640, 2290, 4375.

^{40}K Levels

See ^{39}K(n,γ),(n,n): resonances dataset for 69 resonances in the excitation region: 7800.6 to 7987.8.

Cross Reference (XREF) Flags

A	^{37}Cl(α,nγ)	H	^{40}Ca(n,pγ),(n,p)	O	^{40}K(γ,γ):Mossbauer
B	^{38}Ar(α,d)	I	^{40}Ca(t,^{3}He)	P	^{40}Ca(pol d,2p),(d,2p)
C	^{39}K(n,γ),(pol n,γ) E=thermal	J	^{41}K(p,d)	Q	^{40}Ca(^{7}Li,^{7}Be)
D	^{39}K(d,p)	K	^{41}K(d,t)	R	^{40}Ca(^{12}C,^{12}N),(^{13}C,^{13}N)
E	^{39}K(d,pγ)	L	^{41}Ca(d,^{3}He)	S	^{41}K(n,2n),(n,2nγ)
F	^{40}Ar(p,nγ)	M	^{42}Ca(pol d,α),(d,α)	T	^{42}Ca(p,^{3}He)
G	^{40}Ar(^{3}He,t)	N	(HI,xnγ)		

E(level)†	J$^\pi$‡	$T_{1/2}$#	XREF	Comments
0	4-	1.248×10^9 y *3*	ABCDEFgHIJKLMNOPQRST	μ=-1.298100 *3* (1989Ra17,1974Sa24). Q=-0.061 *5* (1989Ra17,1972Jo09,1971St12). %β-=89.28 *13*. %ε+%β+=10.72 *13*. Jπ: 3rd forbidden β decays to 0+ in ^{40}Ar and ^{40}Ca; unnatural parity in (pol d,α). μ: nuclear magnetic resonance (1974Sa24). Others: -1.2982 *4* (1952Ei09), 1.291 *5* (1949Da01). Q: quadrupole resonance/optical level crossing (1972Jo09,1969Jo06). Others: 1962Bu10, 1968Ne05. %β^-, %ε+%β^+: deduced from γ/β^- (=I(electron capture to 1460.9 level in ^{40}Ar)/I(β^- to ^{40}Ca g.s.))=0.1195 *14* (1978LeZA), Iβ^+(to ^{40}Ar g.s.)=0.00103% *11* (1990En08), and ε/β^+(to ^{40}Ar g.s.)=45.2 *14* (3U theory). Jπ: from unique 3rd forbidden β^- spectral shape for decay to 0+ level and L transfer in charge-particle reactions.

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^{40}K Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
				$T_{1/2}$: from 2004Ko09 and 2002Gr01; the same value from measurements of specific activity of natural potassium salts using liquid-scintillation counting (LSC) technique. (2002Gr01 reported a value of 1.248×10^9 y *2*, later adjusted to 1.248×10^9 y *3* by 2004Ko09 to correct the quoted uncertainty on measured isotopic abundance of ^{40}K). Both papers used natural abundance of ^{40}K as 0.01167% *2* (1975Ga24). The natural abundance of ^{40}K=0.0117% *1* (as recommended in the International Union of Pure and Applied Chemistry 70, 217 (1998), based on the measured value of 1975Ga24) would give about four times larger uncertainty on $T_{1/2}$. The earlier values of 1.265×10^9 y *13* (1999BeZS,1999BeZQ) based on recomputation of 1.277×10^9 y *8* (evaluation by 1973EnVA); and 1.26×10^9 y *1* (evaluation by 1990Ho28 from 14 different measurements out of a total of 34 measurements listed) are in good agreement. Variation of $T_{1/2}$ due to environmental conditions has been studied by 2001No10, where no significant effect has been reported. Earlier (pre-1977) measurements of partial (β^- and ce) and/or total $T_{1/2}$ of ^{40}K: 1977Ce04, 1972Go21, 1966Fe09, 1965Le15, 1965Br25, 1962Fl05, 1961Gl07, 1960Sa31, 1960Eg01, 1959Ke26, 1957We43, 1956Mc20, 1955Ba25, 1955Ko21, 1955Su38, 1953Bu58, 1950Sa52, 1947Gl07. Another 16 references (from 1931 to 1971) are listed by 1990Ho28 and in the 1978 Table of Isotopes (1978LeZA); but are not present in the NSR database. Adopted (1977En02) neutron pickup spectroscopic factor=0.56 *10* (L=3). Adopted (1977En02) neutron stripping spectroscopic factor=0.94 *14* (L=3). Adopted (1977En02) proton pickup spectroscopic factor=2.5 *7* (L=2).
29.8299 *5*	3-	4.25 ns *6*	A CDEFgHIJKLM OPQR	μ=-1.29 *9* (1989Ra17,1974Br12). Jπ: L(t,^{3}He)=3; π=N in (pol d,α); γ(circ pol) in (n,γ). μ: dPAD method (1974Br12). $T_{1/2}$: weighted average of 4.30 ns *6* (α,nγ); 4.24 ns *9* (n,γ); 4.13 ns *12* (γ,γ′) and 3.88 ns *35* (p,nγ). Adopted (1977En02) neutron pickup spectroscopic factor=small (L=1) and 0.56 *10* (L=3). Adopted (1977En02) neutron stripping spectroscopic factor=0.03 *2* (L=1) and 0.96 *12* (L=3). Adopted (1977En02) proton pickup spectroscopic factor=2.5 *7* (L=2).
800.1427 *19*	2-	0.28 ps *4*	ABCDEFgHIJKLM PQR	Jπ: γ(θ,pol) in (p,nγ); γ(circ pol) in (n,γ). Adopted (1977En02) neutron pickup spectroscopic factor=0.01 *1* (L=1) and 0.07 *2* (L=3). Adopted (1977En02) neutron stripping spectroscopic factor=0.02 *1* (L=1) and 0.77 *9* (L=3). Adopted (1977En02) proton pickup spectroscopic factor=1.2 *4* (L=2).
891.398 *18*	5-	0.87 ps *14*	ABCDEFgHIJKLMN PQR	Jπ: γ(θ,pol) in (HI,xnγ); L(α,d)=5. Adopted (1977En02) neutron pickup spectroscopic factor=0.31 *6* (L=3). Adopted (1977En02) neutron stripping spectroscopic factor=0.88 *10* (L=3).

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^{40}K Levels (continued)

E(level)†	J^{π}‡	$T_{1/2}$#	XREF	Comments
				Adopted (1977En02) proton pickup spectroscopic factor=3.2 *9* (L=2).
1643.639 *11*	0+	0.336 μs *12*	A CDEFGHI K ST	Jπ: L(p,^{3}He)=L(^{3}He,t)=0; n(θ) and γ(θ) in (p,nγ). $T_{1/2}$: weighted average of 0.340 μs *7* (p,nγ) and 0.294 μs *23* (n,2nγ). Adopted (1977En02) neutron pickup spectroscopic factor=0.06 *2* (L=2). Adopted (1977En02) neutron stripping spectroscopic factor=0.10 *3* (L=2).
1959.068 *11*	2+	0.59 ps *10*	A CDEFGHI K M Q	Jπ: γ(θ,pol) in (p,nγ). Adopted (1977En02) neutron pickup spectroscopic factor=0.02 *1* (L=0), 0.07 *2* (L=2). Adopted (1977En02) neutron stripping spectroscopic factor=0.01 *1* (L=0), 0.02 *1* (L=2).
2047.354 *16*	2-	0.34 ps *4*	A CDEF Hi M	Jπ: γ(θ,pol) in (p,nγ); γ(circ pol) in (n,γ). Adopted (1977En02) neutron stripping spectroscopic factor=0.52 *13* (L=1).
2069.809 *20*	3-	0.47 ps *10*	ABCDEF Hi L	Jπ: L(d,^{3}He)=0; γ(θ,pol) in (p,nγ); also γ(circ pol) in (n,γ). Adopted (1977En02) neutron stripping spectroscopic factor=0.37 *10* (L=1). Adopted (1977En02) proton pickup spectroscopic factor=0.59 *15* (L=0).
2103.668 *24*	1-	0.52 ps *10*	A CDEF HI	Jπ: γ(θ) in (p,nγ); L(d,p)=1; also γ(circ pol) in (n,γ).
2260.40 *4*	3+	59 fs *10*	A CDEF HI K M Pq	Jπ: γ(θ,pol) in (p,nγ); π=N in (pol d,α). Adopted (1977En02) neutron pickup spectroscopic factor=0.86 *22* (L=2). Adopted (1977En02) neutron stripping spectroscopic factor=0.04 *2* (L=2).
2289.871 *11*	1+	83 fs *14*	A CdEFgHi K m PQ t	Jπ: γ(θ,pol) in (α,nγ).
2290.493 *20*	3-	0.156 ps *20*	ABCdEFgHi PQ t	Jπ: γ(θ,pol) in (α,nγ); L(d,p)=3.
2397.165 *25*	4-	35 fs *14*	A CDEF HI KLM p	Jπ: L(d,^{3}He)=0; π=U in (pol d,α).
2419.171 *21*	2-	0.55 ps *14*	A CDEF HI M p	Jπ: L(d,p)=1; γ(θ) in (p,nγ); π=U in (pol d,α); γ(circ pol) in (n,γ).
2542.77 *17*	7+	1.09 ns *7*	AB E I MN	μ=+4.1 *7* (1989Ra17,1976Bo21). Jπ: γ(θ,pol) in (α,nγ) and (HI,xnγ). μ: iPAD method (1976Bo21). Other: 4.4 *11* (recoil into gas, 1981Le19).
2558			Hi	
2575.93 *3*	2+	0.130 ps *17*	A CDEF Hi K M	Jπ: γ(θ) in (p,nγ); L(d,p)=2; γ from 2-.
2625.990 *25*	0-	0.215 ps *35*	A CDEF HI M	Jπ: from (pol d,α); isotropic γ(θ) in (p,nγ).
2730.372 *18*	1(-)	<28 fs	A C EF I m	Jπ: γ(θ,pol) in (α,nγ) and (p,nγ); L(t,^{3}He)=1.
2746.91 *5*	(2,3)-	0.130 ps *35*	A CD F m	Jπ: γ(θ,pol) in (α,nγ) and (p,nγ).
2756.72 *3*	2+	<21 fs	A C FgHi m	Jπ: γ(θ) in (α,nγ) and (p,nγ) γ(θ); γ to 0+.
2786.644 *16*	3+	<38 fs	AbCdeFg i m	Jπ: γ(θ,pol) in (α,nγ).
2787.4 *3*	(3,4)-	<28 fs	A deF i Lm	Jπ: L(d,^{3}He)=0.
2807.88 *4*	(1,2)-	0.14 ps *4*	A CDEF HI M	Jπ: γ(θ) in (α,nγ); L(d,p)=1.
2879.01 *22*	6+	0.27 ps *10*	A I N	Jπ: γ(θ,pol) in (HI,xnγ).
2950.8 *6*		35 fs *21*	A D I	Jπ: γ to 4-.
2985.87 *4*	(2-,3+)	69 fs *28*	A CD I M	Jπ: γ′s to 2+, 2- and 3-; π=U in (pol d,α). Ef: I: 3017.
3027.95 *3*	2-	<50 fs	A CD I M	Jπ: γ′s to 1+ and 4-; π=U in (pol d,α); RUL for γ to 1+. Ef: I: 3017.
3100.2 *7*	(4,5)+	69 fs *21*	AB g I m	Jπ: L(α,d)=4. Ef: I: 3100.
3109.721 *23*	(1,2)+	<97 fs	CDE g i m	Jπ: L(d,p)=0.
3128.36 *8*	2-	<21 fs	A CD I M	Jπ: γ′s to 1+ and 4-; RUL for γ to 1+. Ef: I: 3120.
3146.44 *5*	1		A CD m	Jπ: γ(θ) in (α,nγ).

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^{40}K Levels (continued)

E(level)†	J^{π}‡	$T_{1/2}$#	XREF	Comments
3153.81 *6*	(2,3)-	<21 fs	A C m	Jπ: γ′s to 2+ and 4-; RUL.
3228.67 *5*	2-	28 fs *21*	A CDE I M	Jπ: L(t,^{3}He)=1+3; π=U in (pol d,α); γ′s to 1+, 1- and 4-.
3293 *10*	UNNATURAL		I M	Jπ: L(t,^{3}He)=(0+2); π=U, Jπ≠0- in (pol d,α).
3368.03 *8*	(2,3)-		CDE I M	Jπ: L(d,p)=1; γ to 4-.
3393.63 *5*	2-		CD i M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α); γ to 2+.
3414.34 *3*	2+		CD i M	Jπ: L(d,p)=0+2; γ′s to 3+ and 3-.
3439.144 *25*	(2+)		C g i	Jπ: γ′s to 0+ and 3-; γ(circ pol) in (n,γ).
3448 *10*	(3,5)+		B g i M	Jπ: L(α,d)=4; π=U in (pol d,α). Ef: β: 3445.
3486.21 *3*	2-		CD i M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).
3517			I	
3556.97 *4*	(1- to 4+)		C M	Jπ: γ′s to 2+ and 3-; Jπ=1-,2+,3- preferred from π=(N) in (pol d,α).
3599.24 *3*	2-		CD i m	Jπ: L(d,p)=1; γ′s to 2- and 3-.
3629.95 *4*	2-,3-	<69 fs	CDE i m	Jπ: L(d,p)=1; γ′s to 3- and 4-.
3663.739 *23*	(3,4)+		CD I M	Jπ: L(α,d)=4; γ to 2+. Ef: M: 3682.
3717 *4*	(≤ 3)-		D g i M	Jπ: L(d,p)=1; Jπ=2- preferred from π=(U) in (pol d,α).
3738.48 *3*	1+		bCD g i M	Jπ: γ′s to 0+ and 3+; π=U in (pol d,α). L(α,d)=4 is inconsistent.
3767.79 *13*	(≤ 3)-		bCD i M	Jπ: L(d,p)=1; Jπ=2- preferred from π=(U) in (pol d,α).
3797.57 *3*	(1+)		CD i M	Jπ: γ to 0+; π=U in (pol d,α); L(d,p)=0,1. Jπ=2- is not completely ruled out.
3821.43 *3*	2-		CD M	Jπ: L(d,p)=1; π=U in (pol d,α); γ to 3-.
3840.228 *24*	(1,2+)		CD i	Jπ: γ to 0+.
3868.66 *4*	2-		CDE i M	Jπ: L(d,p)=1; γ′s to 1+, 1- and 4-; π=U in (pol d,α).
3887.92 *5*	(1-,2,3)		bCD i m	Jπ: γ′s to 2+, 2- and 3-.
3898 *8*			b D i m	
3923.90 *18*	(1- to 4+)		bCD M	Jπ: γ′s to 2+ and 3-; Jπ=2-,3+ preferred from π=(U) in (pol d,α).
3996 *10*	UNNATURAL		i M	Jπ: π=U, Jπ≠0- in (pol d,α).
4020.35 *4*	(≤ 3)-		CD i M	Jπ: L(d,p)=1; Jπ=2-,(0-) preferred from π=(U) in (pol d,α).
4075 *5*			D i M	
4104.46 *4*	(1-,2,3-)		Cd i m	Jπ: γ′s to 1+ and 1-.
4110.84 *3*	(1-,2,3)		Cd m	Jπ: γ′s to 2+, 2- and 3-.
4149.01 *3*	(2-,3)		C M	Jπ: γ′s to 2- and 4-; primary γ from 1+,2+; Jπ=2-,3+ preferred from π=(U) in (pol d,α).
4180.03 *3*	(3-)		C i M	Jπ: γ′s to 2+, 2- and 5-.
4213.07 *9*	(2-,3+)		CD i M	Jπ: γ to 3-; primary γ from 1+,2+; π=U in (pol d,α).
4253.62 *4*	1-		CD I M	Jπ: L(d,p)=1; γ to 0+. π=(U) in (pol d,α) is inconsistent.
4280.52 *8*	2-		C I	Jπ: L(t,^{3}He)=1+3.
4300 *5*	2-		D M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).
4352 *5*	UNNATURAL		D I m	Jπ: π=U in (pol d,α).
4365.6 *4*	(8+)	0.36 ps *14*	mN	Jπ: γ′s to 6+ and 7+.
4384.0 *3*	0+		FG I T	T=2 . Jπ: L(^{3}He,t)=L(p,^{3}He)=0; γ(θ) in (p,nγ). T: from (p,nγ).
4395.88 *3*	(0,1,2)-		CD M	Jπ: L(d,p)=1; γ to 1+; π=(U) in (pol d,α) suggests 2-.
4419.36 *7*	(2-,3,4+)		C	Jπ: γ to 4-; primary γ from 1+,2+.
4472.99 *6*	(2,3)-		CD I M	Jπ: L(d,p)=1; γ′s to 2-, 3- and 4-.
4508			I	
4537.06 *4*	2-		CD I M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α); γ to 3-.
4587 *4*	2-		D M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).
4659 *4*	2-		D M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).

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^{40}K Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
4697 *10*	UNNATURAL		M	Jπ: π=U in (pol d,α).
4744.093 *24*	(2+)		C M	Jπ: γ′s to 0+, 3+ and 3-.
4761 *5*	(1,2)+		D M	Jπ: L(d,p)=0; π=(U) in (pol d,α) prefers 1+.
4788.65 *8*	(1+)		CD I M	Jπ: γ′s to 0+, 0- and 3+; π=(U) in (pol d,α). But L(d,p)=1 suggests (≤3)-.
4805 *4*	(≤ 3)-		D M	Jπ: L(d,p)=1. Ef: M: 4827.
4848 *10*			M	
4872.55 *6*	(2,3)-		CD m	Jπ: L(d,p)=1; γ to 4-.
4875.6 *4*	9+	<0.7 ps	mN	Jπ: γ(θ,pol).
4910 *9*	2-		D M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).
4944 *5*	(≤ 3)-		D M	Jπ: L(d,p)=1; Jπ=2- preferred from π=(U) in (pol d,α).
4992.94 *9*	(2-,3+)		CD M	Jπ: π=U in (pol d,α); γ′s to 1+ and 3-.
5027 *5*			D M	
5063.47 *5*	(2-,3+)		C M	Jπ: γ′s to 2- and 4-; π=U in (pol d,α).
5077 *5*	(≤ 3)-		D	Jπ: L(d,p)=1.
5112 *5*	2-		D M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).
5136 *5*	(≤ 3)-		D	Jπ: L(d,p)=1.
5158 *5*	(≤ 3)-		D M	Jπ: L(d,p)=1.
5208 *5*	2-		D M	Jπ: L(d,p)=1; π=U, Jπ≠0- in (pol d,α).
5870			G	
6227.0 *5*	(8,10)-	<1.4 ps	N	Jπ: γ(θ,pol).
7000			Q	
7472.4 *5*	(9-,11-)		N	Jπ: γ(θ).
7799			C	

† For γ-ray studies, most values are from (n,γ). Weighted averages taken for other cases. See additional levels in (n,γ) defined on the basis of two-quantum cascades (2002Va28). These levels are not listed here due to insufficient information about their decay modes and Jπ′s.

‡ Target (^{39}K) Jπ=3/2+ in L(d,p) arguments; target (^{41}K) Jπ=7/2- in L(d,^{3}He). π=N is natural parity and π=U is unnatural parity.

\# Lifetimes are available for 27 levels from (α,nγ); 22 levels from (p,nγ); 17 levels from (d,pγ); and 5 levels from (HI,xnγ). Weighted averages from different reactions. For values from (d,pγ) and (p,nγ), 15% systematic uncertainty is added in quadrature. Most values are as adopted in the evaluation of 1978En02 (also 1990En08).

γ(^{40}K)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ†	Iγ‡	Mult.§	δ§	α	Comments
29.8299	3-	0	4-	29.8299 *5*	100	M1		0.298	B(M1)(W.u.)=0.15 . δ: ≤0.07 from γγ(θ) in (n,γ); but RUL favors pure M1.
800.1427	2-	29.8299	3-	770.3053 *18*	100	M1(+E2)	0.00 *1*		B(M1)(W.u.)=0.172 *25*.
		0	4-	800.3 *3*[a]	<0.15[a]	[E2]			B(E2)(W.u.)=0.12 .
891.398	5-	29.8299	3-	862.2 *3*[a]	<1.4[a]	[E2]			B(E2)(W.u.)=2.4 .
		0	4-	891.372 *21*	100 *3*	M1+E2	+0.099 *8*		B(E2)(W.u.)=1.4 *4*. B(M1)(W.u.)=0.035 *6*. δ: from (HI,xnγ).
1643.639	0+	800.1427	2-	843.478 *16*	23 *4*	M2			B(M2)(W.u.)=0.0035 *7*.
		29.8299	3-	1613.84 *4*	100.0 *23*	E3			B(E3)(W.u.)=1.08 *7*.
1959.068	2+	800.1427	2-	1158.901 *20*	100.0 *24*	E1(+M2)	0.00 *5*		B(E1)(W.u.)=0.00052 *9*.
		29.8299	3-	1929.34 *10*	22.0 *24*	E1+M2	+0.11 *3*		B(E1)(W.u.)=2.4×10^{-5} *5*. B(M2)(W.u.)=0.36 *21*.
2047.354	2-	800.1427	2-	1247.173 *24*	100 *5*	M1+E2	+0.10 *3*		B(E2)(W.u.)=0.27 *17*.

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ[†]	Iγ[‡]	Mult.[§]	δ[§]	α	Comments
									B(M1)(W.u.)=0.0132 18.
		29.8299	3-	2017.53 4	78 5	M1+E2	+0.02 1		B(E2)(W.u.)=0.0008 8. B(M1)(W.u.)=0.0025 4.
		0	4-	2047.28 4	73 5	E2			B(E2)(W.u.)=1.66 24.
2069.809	3-	891.398	5-	1178.38 4	10 2	E2			B(E2)(W.u.)=3.3 10.
		800.1427	2-	1269.56 5	16 2	M1+E2	-0.15 8		B(E2)(W.u.)=0.08 8. B(M1)(W.u.)=0.0018 5.
		29.8299	3-	2039.94 4	100 4	M1+E2	+0.25 8		B(E2)(W.u.)=0.12 8. B(M1)(W.u.)=0.0026 6.
		0	4-	2070.08 15	74 4	M1(+E2)	-0.04 6		B(M1)(W.u.)=0.0020 5.
2103.668	1-	1643.639	0+	460.092 14[a]	<2.1[a]				
		800.1427	2-	1303.53 7	41 5	M1+E2	+0.30 6		B(E2)(W.u.)=0.8 4. B(M1)(W.u.)=0.0051 12.
		29.8299	3-	2073.74 10	100 5	E2			B(E2)(W.u.)=2.5 5.
2260.40	3+	29.8299	3-	2230.54 5	100.0 24	[E1]			B(E1)(W.u.)=0.00072 13.
		0	4-	2260.11 10	23 4	[E1]			B(E1)(W.u.)=0.00016 4.
2289.871	1+	2103.668	1-	185.97 10[a]	<5.5[a]				
		1959.068	2+	330.798 7	15.5 16				
		1643.639	0+	646.223 5	100 3	M1			B(M1)(W.u.)=0.56 10.
		800.1427	2-	1489.77 5	57 4	E1(+M2)			B(E1)(W.u.)=0.00034 7.
2290.493	3-	891.398	5-	1399.03 4	20 2	[E2]			B(E2)(W.u.)=13.9 23.
		0	4-	2290.58 7	100 2	M1+E2	-0.8 +3-5		B(E2)(W.u.)=2.3 11. B(M1)(W.u.)=0.0060 20.
2397.165	4-	2069.809	3-	327.23 8	10.6 15				
		29.8299	3-	2367.17 5	100 3	M1+E2	+0.25 4		B(E2)(W.u.)=1.1 6. B(M1)(W.u.)=0.030 12.
		0	4-	2397.12 6	39 3	M1+E2			δ: -0.32 12 or -2.4 5.
2419.171	2-	2103.668	1-	315.52 8[a]	<1.0[a]				
		2069.809	3-	349.33 4	0.86 13				
		2047.354	2-	371.792 10[a]	<2.8[a]				
		1959.068	2+	460.092 14[a]	<2.2[a]				
		800.1427	2-	1619.00 4	100 3	M1+E2	+0.24 6		B(E2)(W.u.)=0.46 25. B(M1)(W.u.)=0.0066 17. δ: from (n,γ).
		29.8299	3-	2389.18 5	22 3	M1+E2	-1.4 6		B(E2)(W.u.)=0.17 8. B(M1)(W.u.)=0.00016 11.
		0	4-	2418.69 15	10 1	E2			B(E2)(W.u.)=0.11 4. δ(O/Q)=+0.17 28.
2542.77	7+	891.398	5-	1651.29 12	100.0 23	M2(+E3)	-0.01 2		B(E3)(W.u.)=0.16 . B(M2)(W.u.)=0.176 13. δ: from (α,nγ).
		0	4-	2542.6 3	12.6 5	E3(+M4)	+0.10 7		B(E3)(W.u.)=1.89 15.
2558		0	4-	2558	100				
2575.93	2+	2260.40	3+	315.52 8[a]	<2.2[a]				
		2047.354	2-	528.76 14[a]	<0.6[a]				
		29.8299	3-	2545.85 10	100	E1(+M2)			B(E1)(W.u.)=0.000133 18.
2625.990	0-	2103.668	1-	522.319 7	100 3	(M1)			B(M1)(W.u.)=0.50 9.
		800.1427	2-	1825.77 5	43 3	(E2)			B(E2)(W.u.)=4.8 9.
2730.372	1(-)	2419.171	2-	311.13 4	13 3				
		2103.668	1-	626.1 3[a]	<0.9[a]				
		1959.068	2+	771					Eγ: not seen in (n,γ).
		1643.639	0+	1086.707 19	100.0 10				
		800.1427	2-	1930.2 3	9 5				
2746.91	(2,3)-	1959.068	2+	789 1	6.2 16	[E1]			B(E1)(W.u.)=0.00034 13.
		800.1427	2-	1946.43 17	8 1				

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[§]	δ[§]	α	Comments
		29.8299	3-	2716.95 *11*	100 *3*				
		0	4-	2747.00 *18*	49 *3*				
2756.72	2+	2419.171	2-	337.75 *12*	1.9 *4*				
		1643.639	0+	1113.3 *3*	1.5 *4*	E2			B(E2)(W.u.)=15 .
		800.1427	2-	1956.58 *5*	100 *6*	E1(+M2)			B(E1)(W.u.)=0.00098 .
		29.8299	3-	2726.62 *7*	85 *6*	E1(+M2)			B(E1)(W.u.)=0.00031 .
2786.644	3+	2290.493	3-	496.06 *4*	2.5 *3*				
		1959.068	2+	827.552 *15*	23 *3*	M1+E2	-0.09 *7*		B(M1)(W.u.)=0.17 . δ: from (α,nγ).
		29.8299	3-	2756.81 *7*	100 *3*	E1(+M2)			B(E1)(W.u.)=0.00027 .
		0	4-	2787.0 *6*	7 *3*				
2787.4	(3,4)-	2290.493	3-	496.8 *5*	98 *20*				
		891.398	5-	1896.3 *5*	46 *20*				
		0	4-	2787.10 *25*	100 *20*				
2807.88	(1,2)-	2047.354	2-	760.6 *4*	4.8 *16*				
		1959.068	2+	848.7 *3*[a]	<4.1[a]				
		800.1427	2-	2007.71 *4*	100 *2*				
2879.01	6+	2542.77	7+	336.18 *6*	100 *3*	M1(+E2)	+0.01 *2*		B(M1)(W.u.)=1.4 *6*. δ: from (HI,xnγ).
		891.398	5-	1987.8 *6*	56 *5*	E1(+M2)	-0.06 *5*		B(E1)(W.u.)=0.00010 *4*.
2950.8		0	4-	2950.8 *6*	100				
2985.87	(2-,3+)	2290.493	3-	695.31 *8*[a]	<8.9[a]				
		1959.068	2+	1027.09 *24*	8 *2*				
		800.1427	2-	2185.70 *20*	100 *22*				
		29.8299	3-	2955.94 *16*	88 *22*				
3027.95	2-	2290.493	3-	737.45 *3*	100 *10*				
		2069.809	3-	958.35 *9*	17.8 *21*				
		1959.068	2+	1068.87 *3*[a]	<274[a]				
		0	4-	3027.7 *3*	95 *12*				
3100.2	(4,5)+	891.398	5-	2208.7 *7*	82 *18*	[E1]			B(E1)(W.u.)=0.00035 *14*.
		0	4-	3100	100 *18*	[E1]			B(E1)(W.u.)=0.00015 *6*.
3109.721	(1,2)+	2575.93	2+	534.3 *3*[a]	<3.5[a]				
		2260.40	3+	848.7 *3*[a]	<40[a]				
		2047.354	2-	1062.20 *8*	20.0 *25*				
		1959.068	2+	1150.58 *18*	88 *10*				
		1643.639	0+	1466.11 *3*	100 *10*				
3128.36	2-	2807.88	(1,2)-	320.9 *6*	1.4 *8*				
		2756.72	2+	371.792 *10*[a]	<28[a]				
		2289.871	1+	838.8 *5*	10 *4*				
		29.8299	3-	3098.56 *20*	60 *12*				
		0	4-	3128.06 *13*	100 *12*				
3146.44	1	2419.171	2-	727.1 *3*[a]	<2.0[a]				
		1959.068	2+	1187.45 *8*	9 *1*				
		1643.639	0+	1503.00 *10*	59 *5*				
		800.1427	2-	2346.05 *10*	100 *5*	D(+Q)	+0.1 *2*		
3153.81	(2,3)-	2756.72	2+	397.28 *17*	8 *2*				
		2397.165	4-	756.4 *6*[a]	<21[a]				
		1643.639	0+	1509.9 *3*[a]	<5.8[a]				
		0	4-	3153.5 *3*	100 *8*				
3228.67	2-	2289.871	1+	938.72 *6*	39 *4*	[E1]			B(E1)(W.u.)=0.004 *3*.
		2103.668	1-	1124.91 *6*[a]	<48[a]				
		800.1427	2-	2428.28 *9*	100 *9*				
		29.8299	3-	3198.6 *3*	59 *9*				
		0	4-	3229.4 *4*	50 *6*	[E2]			B(E2)(W.u.)=1.3 *10*.
3368.03	(2,3)-	2746.91	(2,3)-	620.96 *7*[a]	<4.1[a]				
		2047.354	2-	1320.9 *4*	24 *3*				
		800.1427	2-	2568.8 *4*[a]	<2.5[a]				

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γ(^{40}K) (continued)

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_{γ}[†]	I_{γ}[‡]	Mult.[§]	δ[§]	α	Comments
		29.8299	3-	3336.3 *10*	100 *3*				
		0	4-	3368.9 *6*	8 *3*				
3393.63	2-	1959.068	2+	1434.50 *6*	28 *4*				
		800.1427	2-	2593.32 *10*	100 *4*				
3414.34	2+	3228.67	2-	185.97 *10*[a]	<10.2[a]				
		2786.644	3+	627.66 *3*	8 *1*				
		1643.639	0+	1771.4 *5*[a]	<2.7[a]				
		800.1427	2-	2614.21 *9*	100 *3*				
		29.8299	3-	3384.66 *24*	34 *3*				
3439.144	(2+)	2625.990	0-	813.12 *7*[a]	<3.0[a]				
		2103.668	1-	1335.48 *18*	2.1 *5*				
		1959.068	2+	1480.09 *4*	100 *8*	D(+Q)	+0.2 *2*		
		1643.639	0+	1795.45 *4*	85 *8*				
		800.1427	2-	2638.93 *11*	67 *5*				
3486.21	2-	3109.721	(1,2)+	376.53 *3*	14.2 *18*				
		2807.88	(1,2)-	678.13 *20*[a]	<12[a]				
		2730.372	1(-)	756.4 *6*[a]	<36[a]				
		2290.493	3-	1195.81 *7*	25 *3*				
		2047.354	2-	1438.72 *4*	100 *11*				
		800.1427	2-	2685.6 *3*[a]	<110[a]				
3556.97	(1- to 4+)	3027.95	2-	528.76 *14*[a]	<1.7[a]				
		2756.72	2+	800.3 *3*[a]	<6.2[a]				
		2575.93	2+	981.03 *7*[a]	<10.0[a]				
		2289.871	1+	1267.5 *3*[a]	<10.3[a]				
		2069.809	3-	1487.42 *9*[a]	<9.5[a]				
		2047.354	2-	1509.9 *3*[a]	<2.2[a]				
		1959.068	2+	1597.88 *4*	28 *3*				
		29.8299	3-	3526.99 *10*	100 *3*				
3599.24	2-	2985.87	(2-,3+)	613.384 *24*	22 *3*				
		2575.93	2+	1023.21 *4*	27 *3*				
		2289.871	1+	1308.9 *4*[a]	<4.5[a]				
		2290.493	3-	1308.9 *4*[a]	<4.5[a]				
		2047.354	2-	1551.77 *9*	11 *1*				
		800.1427	2-	2799.30 *18*	100 *7*				
		29.8299	3-	3569.30 *8*	48 *4*				
3629.95	2-,3-	3027.95	2-	602.26 *17*	10.3 *18*				
		2397.165	4-	1232.74 *3*	42 *5*				
		2069.809	3-	1560.44 *19*	5.3 *5*				
		29.8299	3-	3599.62 *20*	58 *5*				
		0	4-	3629.94 *15*	100 *5*				
3663.739	(3,4)+	3128.36	2-	534.3 *3*[a]	<0.7[a]				
		2985.87	(2-,3+)	678.13 *20*[a]	<2.1[a]				
		2290.493	3-	1373.227 *21*	100 *8*				
		1959.068	2+	1704.73 *9*	72 *8*				
		29.8299	3-	3633.88 *9*	48 *4*				
		0	4-	3663.32 *9*	34 *3*				
3738.48	1+	2575.93	2+	1162.59 *24*[a]	<46[a]				
		2260.40	3+	1478.01 *6*	48 *4*				
		2047.354	2-	1691.26 *6*	16 *2*				
		1643.639	0+	2094.61 *10*	7 *1*				
		800.1427	2-	2938.32 *9*	100 *7*				
3767.79	(≤ 3)-	3146.44	1	620.96 *7*[a]	<43[a]				
		3128.36	2-	640.4 *6*[a]	<27[a]				
		2786.644	3+	981.03 *7*[a]	<63[a]				
		2419.171	2-	1348.06 *14*[a]	<21[a]				
		800.1427	2-	2967.8 *3*	100 *12*				
3797.57	(1+)	3414.34	2+	383.01 *18*	2.5 *5*				
		2985.87	(2-,3+)	811.39 *13*	2.9 *5*				
		2575.93	2+	1221.71 *7*	8.5 *10*				

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ[†]	Iγ[‡]	Mult.[§]	δ[§]	α	Comments
		1959.068	2+	1838.61 *8*	56 *5*				
		1643.639	0+	2153.81 *4*	100 *5*				
3821.43	2-	3486.21	2-	335.44 *14*[a]	<11[a]				
		2787.4	(3,4)-	1034.28 *20*[a]	<11[a]				
		2746.91	(2,3)-	1074.39 *9*	40 *5*				
		2730.372	1(-)	1090.9 *3*	10 *2*				
		2397.165	4-	1424.229 *23*	100 *7*				
		2290.493	3-	1530.7 *3*	17 *5*				
		29.8299	3-	3791.9 *3*	50 *7*				
3840.228	(1,2+)	3109.721	(1,2)+	730.48 *15*	3.9 *7*				
		2069.809	3-	1771.4 *5*[a]	<5.0[a]				
		1959.068	2+	1881.20 *5*	80 *7*				
		1643.639	0+	2196.61 *5*	54 *5*				
		800.1427	2-	3040.24 *13*	100 *5*				
3868.66	2-	3414.34	2+	454.19 *8*	6.3 *9*				
		3228.67	2-	640.4 *6*[a]	<7.1[a]				
		2746.91	(2,3)-	1121.77 *7*	18 *2*				
		2289.871	1+	1578.97 *12*	5.6 *7*				
		2103.668	1-	1765.24 *15*	37 *5*				
		800.1427	2-	3068.7 *4*	42 *7*				
		29.8299	3-	3838.50 *7*	100 *7*				
		0	4-	3868.3 *10*	19 *7*				
3887.92	(1-,2,3)	2756.72	2+	1131.17 *5*	33 *4*				
		800.1427	2-	3088.3 *5*	63 *10*				
		29.8299	3-	3857.97 *11*	100 *8*				
3923.90	(1- to 4+)	3738.48	1+	185.97 *10*[a]	<56[a]				
		3228.67	2-	695.31 *8*[a]	<20[a]				
		2575.93	2+	1348.06 *14*[a]	<17[a]				
		2103.668	1-	1820.35 *5*[a]	<128[a]				
		1959.068	2+	1964.27 *23*	18 *3*				
		29.8299	3-	3895.7 *11*	100 *52*				
4020.35	(≤ 3)-	3486.21	2-	534.3 *3*[a]	<2.8[a]				
		3393.63	2-	626.1 *3*[a]	<3.1[a]				
		2985.87	(2-,3+)	1034.28 *20*[a]	<12[a]				
		2103.668	1-	1916.51 *6*	78 *8*				
		2047.354	2-	1973.00 *4*	100 *8*				
		800.1427	2-	3220.08 *21*	73 *8*				
4104.46	(1-,2,3-)	3663.739	(3,4)+	440.77 *7*	4.8 *6*				
		3599.24	2-	504.5 *5*	6.3 *18*				
		2985.87	(2-,3+)	1118.38 *13*	5.5 *8*				
		2756.72	2+	1348.06 *14*[a]	<3.5[a]				
		2290.493	3-	1813.94 *14*	7.3 *9*				
		2103.668	1-	2001.24 *20*	13.7 *20*				
		2047.354	2-	2057.07 *5*	14.1 *16*				
		800.1427	2-	3304.24 *11*	100 *7*				
4110.84	(1-,2,3)	3109.721	(1,2)+	1001.05 *5*	25 *3*				
		3027.95	2-	1082.92 *7*	63 *8*				
		2985.87	(2-,3+)	1124.91 *6*[a]	<37[a]				
		2756.72	2+	1354.12 *3*	50 *5*				
		2290.493	3-	1820.35 *5*[a]	<83[a]				
		1643.639	0+	2467.31 *10*[a]	<21[a]				
		800.1427	2-	3310.9 *5*	38 *9*				
		29.8299	3-	4080.69 *12*	100 *7*				
4149.01	(2-,3)	3393.63	2-	756.4 *6*[a]	<7[a]				
		3228.67	2-	920.12 *18*[a]	<1.5[a]				
		2985.87	(2-,3+)	1162.59 *24*[a]	<28[a]				
		2397.165	4-	1751.76 *5*	20.1 *20*				
		2290.493	3-	1858.51 *5*	48 *5*				
		2260.40	3+	1888.43 *8*	8.8 *10*				

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[§]	δ[§]	α	Comments
		800.1427	2-	3348.91 *10*	100 *5*				
		0	4-	4148.4 *3*	12.0 *16*				
4180.03	(3-)	3439.144	(2+)	740.89 *6*	100 *9*				
		3228.67	2-	951.16 *7*	16.6 *19*				
		2786.644	3+	1393.16 *8*	48 *6*				
		2419.171	2-	1761.10 *7*[a]	<12[a]				
		1959.068	2+	2221.27 *11*	70 *9*				
		891.398	5-	3286.4 *8*	58 *15*				
4213.07	(2-,3+)	3486.21	2-	727.1 *3*[a]	<10[a]				
		3414.34	2+	798.8 *3*[a]	<45[a]				
		2069.809	3-	2143.37 *11*	100 *12*				
		1643.639	0+	2568.8 *4*[a]	<24[a]				
4253.62	1-	3153.81	(2,3)-	1100.13 *18*	2.5 *4*				
		3128.36	2-	1124.91 *6*[a]	<7.0[a]				
		2985.87	(2-,3+)	1267.5 *3*[a]	<6.1[a]				
		2103.668	1-	2149.93 *5*	25.1 *23*				
		2069.809	3-	2183.70 *20*	28 *14*				
		2047.354	2-	2206.35 *10*[a]	<44[a]				
		1643.639	0+	2609.98 *9*	83 *7*				
		800.1427	2-	3452.2 *10*	100 *6*				
		29.8299	3-	4223.66 *7*	49 *3*				
4280.52	2-	2575.93	2+	1704.70 *20*	85 *44*				
		2047.354	2-	2233.0 *4*	43 *43*				
		800.1427	2-	3480.6 *5*	35 *9*				
		29.8299	3-	4249.5 *4*	32 *9*				
		0	4-	4280.35 *22*	100 *11*				
4365.6	(8+)	2879.01	6+	1486.3 *5*	19 *6*	[E2]			B(E2)(W.u.)=4.3 *22*.
		2542.77	7+	1822.9 *3*	100 *6*				
4384.0	0+	2730.372	1(-)	1654	32 *4*				
		2289.871	1+	2094	100 *4*				
4395.88	(0,1,2)-	3738.48	1+	657.39 *3*	33 *3*				
		3128.36	2-	1267.5 *3*[a]	<44[a]				
		2730.372	1(-)	1665.43 *4*	60 *6*				
		2047.354	2-	2348.72 *9*	100 *13*				
4419.36	(2-,3,4+)	3663.739	(3,4)+	756.4 *6*[a]	<22[a]				
		3556.97	(1- to 4+)	862.2 *3*[a]	<3.2[a]				
		3153.81	(2,3)-	1265.54 *9*	53 *5*				
		3109.721	(1,2)+	1308.9 *4*[a]	<12[a]				
		2575.93	2+	1843.33 *9*	17.6 *19*				
		2397.165	4-	2022.32 *17*	45 *5*				
		29.8299	3-	4389.32 *18*	100 *8*				
4472.99	(2,3)-	3439.144	(2+)	1034.28 *20*[a]	<10[a]				
		3393.63	2-	1079.44 *13*	25 *3*				
		2985.87	(2-,3+)	1487.42 *9*[a]	<24[a]				
		2746.91	(2,3)-	1725.68 *17*[a]	<8.2[a]				
		2625.990	0-	1846.72 *6*[a]	<26[a]				
		2069.809	3-	2403.04 *9*	30 *3*				
		0	4-	4472.80 *11*	100 *8*				
4537.06	2-	3738.48	1+	798.8 *3*[a]	<5.4[a]				
		3228.67	2-	1308.9 *4*[a]	<3.8[a]				
		3109.721	(1,2)+	1427.45 *18*	1.9 *3*				
		2575.93	2+	1961.11 *6*	13.5 *14*				
		2069.809	3-	2467.31 *10*[a]	<5.9[a]				
		1959.068	2+	2577.63 *10*	28 *3*				
		800.1427	2-	3737.01 *10*	100 *6*				
		29.8299	3-	4506.96 *7*	68 *5*				
4744.093	(2+)	4180.03	(3-)	563.86 *6*	7.5 *10*				
		4104.46	(1-,2,3-)	640.4 *6*[a]	<4.5[a]				
		3840.228	(1,2+)	903.878 *23*	15.3 *15*				

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[§]	δ[§]	α	Comments
		3797.57	(1+)	946.29 *8*	3.8 *5*				
		3599.24	2-	1144.7 *5*	8 *3*				
		2807.88	(1,2)-	1935.7 *3*	12.8 *23*				
		2730.372	1(-)	2013.90 *20*	17 *3*				
		2575.93	2+	2168.16 *4*	18.3 *19*				
		2289.871	1+	2454.7 *3*	2.5 *4*				
		2260.40	3+	2483.8 *3*	3.0 *8*				
		1959.068	2+	2784.4 *4*	23 *5*				
		1643.639	0+	3100.42 *20*	38 *14*				
		800.1427	2-	3943.81 *6*	100 *5*				
4788.65	(1+)	4472.99	(2,3)-	315.52 *8*[a]	<22[a]				
		4253.62	1-	534.3 *3*[a]	<3.2[a]				
		4149.01	(2-,3)	640.4 *6*[a]	<16[a]				
		4110.84	(1-,2,3)	678.13 *20*[a]	<10[a]				
		3868.66	2-	920.12 *18*[a]	<6.1[a]				
		3663.739	(3,4)+	1124.9 *6*[a]	<43[a]				
		3027.95	2-	1761.10 *17*[a]	<11[a]				
		2756.72	2+	2031.6 *3*	93 *14*				
		2625.990	0-	2162.16 *17*	14.6 *18*				
		2260.40	3+	2528.44 *11*	50 *5*				
		2103.668	1-	2685.6 *3*[a]	<86[a]				
		1643.639	0+	3144.30 *19*	100 *11*				
4872.55	(2,3)-	4537.06	2-	335.44 *14*[a]	<16[a]				
		3153.81	(2,3)-	1718.68 *4*	65 *3*				
		3146.44	1	1725.68 *17*[a]	<13[a]				
		2756.72	2+	2115.77 *14*	12.3 *16*				
		1959.068	2+	2912.6 *3*	56 *8*				
		29.8299	3-	4842.8 *4*	29 *5*				
		0	4-	4872.47 *14*	100 *8*				
4875.6	9+	4365.6	(8+)	509.4 *10*	56 *17*				
		2542.77	7+	2332.8 *4*	100 *11*	E2			B(E2)(W.u.)=0.92 .
4992.94	(2-,3+)	4180.03	(3-)	813.12 *7*[a]	<14[a]				
		3923.90	(1- to 4+)	1068.87 *3*[a]	<121[a]				
		3146.44	1	1846.72 *6*[a]	<32[a]				
		2786.644	3+	2206.35 *10*[a]	<227[a]				
		2290.493	3-	2702.60 *16*	85 *9*				
		2069.809	3-	2922.91 *20*	100 *9*				
		29.8299	3-	4962.2 *4*	32 *6*				
5063.47	(2-,3+)	3368.03	(2,3)-	1695.44 *8*	32 *4*				
		3109.721	(1,2)+	1953.74 *6*	100 *10*				
		2419.171	2-	2644.0 *3*	84 *13*				
		0	4-	5062.9 *4*	23 *3*				
6227.0	(8,10)-	4875.6	9+	1351.37 *18*	100 *8*	E1(+M2)	-0.07 *5*		B(E1)(W.u.)=0.00016 .
		4365.6	(8+)	1861	<5				
		2542.77	7+	3684	<2				
7472.4	(9-,11-)	6227.0	(8,10)-	1245.42 *22*	100	D+Q	+0.13 *7*		

† Primarily from (n,γ). Other values are either from individual reactions or weighted averages when quoted precision is comparable.
‡ Weighted averages taken when values are available from different datasets.
§ Primarily from $\gamma(\theta)$ and γ(pol) data in (p,nγ). A few values are also available from (HI,xnγ), (n,γ) and (α,nγ).
a Multiply placed with undivided intensity.

^{37}Cl(α,nγ) 1973Da18,1971Ja15,1971We09

1973Da18, 1974Th07: E=6.90-8.00 MeV. Measured Eγ, Iγ, $\gamma\gamma$. $\gamma(\theta)$, γ(lin pol) for γ rays from 2291, 2543, 2787 and 2879 levels were measured by 1974Th07.
1971Ja15: E=6.25, 7.00, 8.00 MeV. Measured γ, $\gamma\gamma$, $\gamma(\theta)$, lifetimes by DSAM.
1971We09, 1970Ba34: E=6.0-7.4 MeV. Measured lifetimes by DSAM.
Others:.
1974Br12: E=5.0 MeV. Measured $\gamma(\theta$,H,t), lifetime by pulsed beam for 30-keV level.
1973Gr19: E=8.5, 9.5 MeV. Measured lifetime for 2542 level by recoil-distance Doppler shift method.
1969Ka18: E≈threshold. Measured lifetimes by DSAM.

^{40}K Levels

E(level)	Jπ†	$T_{1/2}$#	Comments
0	4-		
29.6 *10*	3-	4.30 ns *6*	g=-0.43 *3* (1974Br12). $T_{1/2}$: γ(t) (1974Br12).
800.2 *10*	2-	0.28 ps *10*@	
891.0 *10*	5-	0.80 ps *18*@	
1645.0 *10*	0+		
1958.8 *5*	2+	0.70 ps *18*@	
2047.0 *10*	2-	0.37 ps *11*@	
2069.7 *5*	3-	0.43 ps *12*@	
2102.9 *6*	1-	0.57 ps *14*@	
2260.6 *10*	3+	59 fs *17*@	
2290.0 *6*	1+	76 fs *21*@	
2291.1 *2*	3-	0.15 ps *3*@	Jπ: 3- is preferred by $\gamma(\theta)$ and γ(lin pol) data of 1974Th07; 4+ is not completely ruled out by these data.
2397.9 *3*	4-	35 fs *14*@	
2419.4 *4*	2-	0.46 ps *+30-18*	$T_{1/2}$: other: >1.0 ps (1971We09).
2542.8 *4*	7+‡	1.04 ns *14*	$T_{1/2}$: from 1973Gr19. Other: 2.1 ps to 35 ns (1971Ja15).
2575.6 *5*	2+	78 fs *21*@	
2626.0 *6*	0-	0.21 ps *7*@	
2730.9 *8*	1	<50 fs	
2747.6 *3*	(2,3)-	0.19 ps *11*	
2756.2 *5*	2+	<21 fs	
2786.6 *5*	3+‡		
2787.4 *3*	(3,4)-	55 fs *20*	
2808.2 *6*	(1,2)-	0.10 ps *7*	
2879.4 *5*	6+‡	0.27 ps *10*	Jπ: from γ(lin pol), 6+ is favored (1974Th07).
2950.8 *6*		35 fs *21*	
2986.6 *8*	(2-,3+)	69 fs *28*	
3028.1 *4*	2-	<50 fs	
3100.2 *7*	(4,5)+	69 fs *21*	
3128.4 *8*	2-	<21 fs	
3146.7 *6*	1		
3155.1 *8*	(2,3)-	<21 fs	
3230.0 *7*	2-		

† From Adopted Levels.
‡ From $\gamma(\theta)$ and/or γ(lin pol) (1974Th07).
# From DSAM (1971Ja15), unless otherwise stated.
@ From DSAM, weighted average of values from 1971Ja15 and 1971We09

γ(^{40}K)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.‡	δ‡	Comments
29.6	3-	0	4-	29.6	100			
800.2	2-	29.6	3-	771	100			
891.0	5-	0	4-	891	100			

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ[†]	I_γ[†]	Mult.[‡]	δ[‡]	Comments
1645.0	0+	800.2	2-	845[a]	20 *5*[a]			Iγ(845)/Iγ(1615)=15 *3*/85 *3* (1971We09).
		29.6	3-	1615[a]	80 *5*[a]			
1958.8	2+	800.2	2-	1158.9 *2*	82 *2*			
		29.6	3-	1929.6 *2*	18 *2*			Iγ(1930)/Iγ(1159)=22 *5*/78 *5* (1971Ja15); 19 *4*/81 *4* (1971We09).
2047.0	2-	800.2	2-	1247[a]	40 *5*[a]			
		29.6	3-	2017[a]	35 *5*[a]			
		0	4-	2047[a]	25 *5*[a]			Iγ(2047)/Iγ(2017)/Iγ(1247)=28 *4*/33 *4*/39 *4* (1971We09).
2069.7	3-	891.0	5-	1178.4 *6*	3 *1*			Iγ(1178)/Iγ(1269)/Iγ(2041)/Iγ(2070)=2 *1*/8 *2*/56 *5*/34 *5* (1971Ja15); 6 *2*/8 *2*/46 *8*/40 *8* (1971We09).
		800.2	2-	1268.9 *6*	5 *1*			
		29.6	3-	2041.0 *9*	47 *3*			
		0	4-	2070	45 *3*			
2102.9	1-	800.2	2-	1303.6 *5*	22 *4*			Iγ(1304)/Iγ(2073)=32 *5*/68 *5* (1971Ja15); 33 *8*/67 *8* (1971We09).
		29.6	3-	2073.1 *4*	78 *4*			
2260.6	3+	29.6	3-	2231[a]	85 *3*[a]			
		0	4-	2261[a]	15 *3*[a]			Iγ(2261)/Iγ(2231)=19 *4*/81 *4* (1971We09).
2290.0	1+			224	<2			
		1958.8	2+	331	8 *2*			
		1645.0	0+	646.2 *4*	59 *4*			
		800.2	2-	1490.3 *5*	33 *3*			Iγ(1490)/Iγ(646)=38 *5*/62 *5* (1971Ja15); 37 *4*/63 *4* (1971We09).
2291.1	3-	891.0	5-	1400.0 *4*	19 *3*			Iγ(1400)/Iγ(2291)=15 *2*/85 *2* (1971Ja15).
		0	4-	2290.8 *2*	81 *3*	(M1+E2)	-0.9 *4*	δ: for J=3-. δ=-0.02 *9* for J=4+. A_2=+0.40 *1*, A_4=-0.09 *2*, POL=-0.67 *8* (1974Th07). Iγ: 100 (1971We09).
2397.9	4-	29.6	3-	2367.9 *3*	70 *4*			
		0	4-	2398.1 *3*	30 *4*			Iγ(2398)/Iγ(2368)=35 *10*/65 *10* (1971Ja15); 27 *4*/73 *4* (1971We09).
2419.4	2-	1958.8	2+	461	<2			
		800.2	2-	1619.6 *2*	79 *3*			
		29.6	3-	2389.7 *3*	15 *2*			Iγ(2390)/Iγ(1620)=10 *5*/90 *5* (1971Ja15). Iγ(2419)/Iγ(2389)/Iγ(1620)=7 *2*/20 *4*/73 *4* (1971We09).
		0	4-	2419.4 *5*	6 *1*			
2542.8	7+	891.0	5-	1651.5 *5*	88 *2*	M2(+E3)	0.00 *3*	Iγ: 100 (1971Ja15). A_2=+0.56 *4*, A_4=-0.27 *4*, POL=-0.68 *8* (1974Th07).
		0	4-	2542.4 *10*	12 *2*			
2575.6	2+	29.6	3-	2546.1 *2*	100			
2626.0	0-	2102.9	1-	523.3 *5*	70 *3*			
		1958.8	2+	667	<5			
		800.2	2-	1826.4 *2*	30 *3*			Iγ(1826)/Iγ(523)=33 *5*/67 *5* (1971We09); <20/100 (1971Ja15).
2730.9	1	2290.0	1+	441	<12			
		1645.0	0+	1086.9 *6*	94 *4*			Iγ: 100 (1971Ja15).

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.‡	δ‡	Comments
		800.2	2-	1931	6 *4*			
2747.6	(2,3)-	2069.7	3-	678	<3			
		1958.8	2+	789 *1*	4 *1*			Iγ(789)/Iγ(2718)/Iγ(2748)=10 *3*/60 *10*/30 *10* (1971Ja15).
		29.6	3-	2717.7 *2*	64 *5*			
		0	4-	2747.7 *3*	32 *3*			
2756.2	2+	800.2	2-	1956.0 *2*	64 *5*			
		29.6	3-	2727.3 *3*	34 *3*			Iγ(2727)/Iγ(1956)=38 *12*/62 *12* (1971Ja15).
2786.6	3+	1958.8	2+	827.60 *25*	22 *3*			Iγ(828)/Iγ(2757)=19 *5*/27 *8* (1971Ja15).
		29.6	3-	2757.2 *3*	78 *3*	E1(+M2)	-0.09 *+22-5*	A_2=+0.35 *2*, A_4=-0.01 *2*. POL=-1.02 *20* (1974Th07).
2787.4	(3,4)-	2291.1	3-	496.8 *5*	40 *8*			
		891.0	5-	1896.3 *5*	19 *8*			Iγ(1896)/Iγ(496)/Iγ(2787)=12 *1*/19 *2*/23 *2* (1971Ja15).
		0	4-	2787.10 *25*	41 *8*			
2808.2	(1,2)-	800.2	2-	2008.5 *2*	100			
2879.4	6+	2542.8	7+	336.4 *4*	62 *4*			
		891.0	5-	1987.8 *7*	38 *4*	D(+Q)	-0.06 *+4-5*	A_2=-0.33 *5*, A_4=-0.10 *6*, POL=+0.32 *26* (1974Th07). Iγ(1988)/Iγ(336)=40 *5*/60 *5* (1971Ja15).
2950.8		0	4-	2950.8 *6*	100			
2986.6	(2-,3+)	800.2	2-	2186.2 *10*	15 *10*			Iγ(2186)/Iγ(2958)=65 *35*/35 *35* (1971Ja15).
		29.6	3-	2958.1 *6*	85 *10*			
3028.1	2-	2291.1	3-	737.5 *5*	23 *4*			
		1958.8	2+	1068.2 *5*	54 *5*			
		0	4-	3028.8 *8*	23 *4*			I_γ: 100 (1971Ja15).
3100.2	(4,5)+	891.0	5-	2208.7 *7*	45 *10*			Iγ(2209)/Iγ(3100)=35 *7*/65 *7* (1971Ja15).
		0	4-	3100	55 *10*			
3128.4	2-	2047.0	2-	1081	<10			
		29.6	3-	3099	53 *10*			
		0	4-	3128.4 *8*	47 *10*			I_γ: 100 (1971Ja15).
3146.7	1	1645.0	0+	1503.1 *4*	33 *5*			
		800.2	2-	2346.8 *2*	67 *5*			
3155.1	(2,3)-	0	4-	3155.1 *8*	100			
3230.0	2-	800.2	2-	2428.4 *10*	<16			
		29.6	3-	3201.1 *10*	75 *6*			
		0	4-	3229.4 *10*	25 *6*			

† From 1973Da18, unless stated otherwise.
‡ From γ(θ), γ(lin pol) data of 1974Th07.
[a] From 1971Ja15.

^{38}Ar(α,d) 1976De24

1976De24: E=34 MeV. Measured $\sigma(\theta)$, FWHM≈100 keV, DWBA analysis. Absolute cross sections are accurate to 20%.

^{40}K Levels

E(level)†	J^π	L	dσ/dΩ (μb/sr)‡
0		(3)	60
800		(1)	70
891		5	200
2070		3	45
2290		3	65
2543		6	1000
2787		4	700
3094 *25*		4	150
3445 *25*		4	120
3753 *25*		4	330
3908 *25*			300

† Rounded off values from Adopted Levels for levels below 3000.
‡ At 20° (c.m. system).

^{39}K(n,γ),(pol n,γ) E=thermal 1984Vo01,1972Op01,1970Jo04

1984Vo01: (n,γ). Measured Eγ, Iγ with Grenoble curved-crystal spectrometer and a pair spectrometer. A total of 427 γ′s reported, out of which 302 were placed amongst 63 levels, with 38 γ′s doubly or multiply assigned.
1972Op01: (n,γ). Measured Eγ, Iγ, γγ; a total of 222 γ′s reported out of which 187 γ′s were associated with 56 levels. γγ coin data involved about 25 transitions.
1970Jo04: (n,γ). Measured Eγ, Iγ, γγ; a total of 252 γ′s reported out of which 202 γ′s were associated with 56 levels. γγ coin data involved 62 transitions.
2002Va28: measured γγ coin, two-quantum cascades. A total of 70 intermediate levels were found from 96 cascades.
Others:.
2003MoZU, 2002Re13: compilations.
2001Ac04: (n,γ). Measured Eγ, Iγ. Deduced k_0 factor.
1988Se06: (n,γ). Measured γγ(θ).
1974Op01, 1972Op02, 1969Ab03: (pol n,γ). Measured γ(circ pol) of capture γ′s to nine levels; deduced interference in capture state.
1974IsZX: (n,γ). Measured Eγ, Iγ.
1972Se19: measured relative intensities for six secondary γ′s and nine primary γ′s.
1970Ei03: (pol n,γ). Measured γ(circ pol) of capture γ′s to 30-keV level.
1969Bo04: measured γγ(t) for 30-keV level.
1966Ke07: (n,γ). Measured Eγ, Iγ.
1965Ru06: (n,γ). Measured Eγ, Iγ, natural target.
1956Br42, 1956Ad49, 1953Ba76, 1952Ki32: (n,γ). Measured Eγ, Iγ.
The γ-ray placements and the resulting level scheme is from 1984Vo01 which is based on earlier (n,γ) studies of 1972Op01 and 1970Jo04 combined with other reactions. However, based on a better Eγ precision achieved in the work of 1984Vo01, placements for several γ rays are different than proposed by 1970Jo04 and/or 1972Op01.

^{40}K Levels

The following levels reported by 1972Op01 and/or 1970Jo04 have been omitted since these have not been confirmed in the work of 1984Vo01 (either the γ′s decaying from these levels were not observed or were placed differently based on better precision in 1984Vo01): 4586.8, 4665.8 from 1972Op01; 2457.5, 2557.9, 2978.6, 3378.3, 3875.0, 4273.3, 4579.6 from 1970Jo04; 2947.5, 3711.1, 3902.1, 4464.6, 4806.9, 4908.5 from 1972Op01 and 1970Jo04.

E(level)†	Jπ‡	$T_{1/2}$	Comments
0.0	4-		
29.8299 *5*	3-#	4.24 ns *9*	$T_{1/2}$: from γγ(t) (1969Bo04).
521.7 *10*&			
800.1427 *19*	2-#		
891.398 *18*	5-		
1084.3 *10*&			
1173.4 *16*&			
1228.2 *5*&			
1248.4 *3*&			
1330.5 *19*&			
1409.2 *17*&			
1520.7 *11*&			
1556.6 *22*&			
1643.639 *11*	0+		
1877.7 *8*&			
1959.068 *11*	2+		
2047.354 *16*	2-#		
2069.809 *20*	3-@		
2076.1 *7*&			
2103.668 *24*	1-@		Jπ: (1,2,3)- (1974Op01).
2260.40 *4*	3+		
2271.1 *10*&			
2289.871 *11*	1+		
2290.493 *20*	3-		
2397.165 *25*	4-		
2419.171 *21*	2-#		

Continued on next page (footnotes at end of table)

^{40}K Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$	Comments
2422.1 *16*&			
2575.93 *3*	2+		Jπ: 2+ (1984Vo01).
2618.1 *12*&			
2625.990 *25*	0-		
2730.372 *18*	1		
2746.91 *5*	(2,3)-		
2756.72 *3*	2+		Jπ: 2+,(3) (1984Vo01).
2786.644 *16*	3+		
2807.88 *4*	(1,2)-		
2925.1 *10*&			
2939.2 *8*&			
2946.2 *11*&			
2985.87 *4*	(2-,3+)		
3000.0 *4*&			
3027.95 *3*	2-		
3063.5 *11*&			
3093.8 *7*&			
3109.721 *23*	(1,2)+		
3128.36 *8*	2-		Jπ: (2-,3,4+) (1984Vo01).
3140.7 *2*&			
3146.44 *5*	1		
3153.81 *6*	(2,3)-		Jπ: 3- (1984Vo01).
3228.67 *5*	2-		
3305.2 *12*&			
3326.6 *6*&			
3368.03 *8*	(2,3)-		
3373.4 *15*&			
3393.63 *5*	2-		
3414.34 *3*	2+		
3428.9 *7*&			
3439.144 *25*	(2+)#		Jπ: (1,2) (1974Op01), 1-,2+ (1984Vo01).
3486.21 *3*	2-		
3517.7 *11*&			
3528.4 *9*&			
3556.97 *4*	(1- to 4+)		
3578.3 *10*&			
3599.24 *3*	2-		
3629.95 *4*	2-,3-		Jπ: (2,3)- (1984Vo01).
3655.6 *3*&			
3663.739 *23*	(3,4)+		Jπ: (2-,3,4+) (1984Vo01).
3709.5 *13*&			
3719.6 *12*&			
3738.48 *3*	1+		Jπ: 1+,(2-,3+) (1984Vo01).
3767.79 *13*	(≤ 3)-		Jπ: (1-,2,3) (1984Vo01).
3797.57 *3*	1+		
3807.8 *11*&			
3821.43 *3*	2-		
3840.228 *24*	(1,2+)		
3856.4 *6*&			
3868.66 *4*	2-		Jπ: 3-,(2-) (1984Vo01).
3887.92 *5*	(1-,2,3)		
3923.90 *18*	(1- to 4+)		
3933.0 *15*&			
4020.35 *4*	(≤ 3)-		
4058.3 *10*&			
4104.46 *4*	(1-,2,3-)		

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^{40}K Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$	Comments
4110.84 *3*	(1-,2,3)		
4149.01 *3*	(2-,3)		
4165.4 *7*&			
4180.03 *3*	(3-)		
4213.07 *9*	(2-,3+)		
4253.62 *4*	1-@		Jπ: (1,2)- (1974Op01).
4280.52 *8*	2-		
4395.88 *3*	(0,1,2)-		Jπ: (≤3)- (1984Vo01).
4419.36 *7*	(2-,3,4+)		
4472.99 *6*	(2,3)-		
4537.06 *4*	2-		
4744.093 *24*	(2+)		
4788.65 *8*	(1+)		
4872.55 *6*	(2,3)-		
4906.9 *13*&			
4992.94 *9*	(2-,3+)		Jπ: (1-:4+) (1984Vo01).
5063.47 *5*	(2-,3+)		
6311 *3*&			
7799.534 *14*	1+,2+		E(level): S(n)=7799.51 *7* (2003Au03). Jπ: s-wave capture in ^{39}K (g.s. Jπ=3/2)+. From $\gamma\gamma(\theta)$, an incoherent superposition of 1+ and 2+ is allowed, while from γ(circ pol) superposition is coherent, with either constructive or destructive interference.

† From least-squares fit to Eγ's. 38 γ rays which are doubly or multiply placed were not used in the least-squares procedure. Out of 263 γ rays used in the fit, five γ rays lie outside 3 σ's and and 34 γ rays outside 2 σ's.
‡ From Adopted Levels, unless otherwise stated.
# From γ(circ pol) (1974Op01) and $\gamma\gamma(\theta)$ (1988Se06).
@ From γ(circ pol) (1974Op01) and arguments in Adopted Levels.
& From 2002Va28 based on two-quantum cascades. This level is not included in the Adopted Levels due to insufficient information about its decay mode and Jπ.

γ(^{40}K)

The following γ's reported by 1972Op01 and/or 1970Jo04 have been omitted since these are not confirmed in the high-resolution work of 1984Vo01: 246.9, 380.2, 1582.9, 1674.1, 2102.1, 2294.9, 3120.5, 3339.1, 3447.0, 4110.7, 4299.9, 4452.6, 4769.5, 4908.6, 5495.9 and 5840.9 from 1972Op01; 243.6, 284.6, 291.5, 297.5, 300.3, 368.3, 387.1, 421.6, 432.6, 475.9, 485.3, 608.6, 701.8, 720.7, 734.6, 1008.3, 1139.1, 1261.1, 1410.6, 1468.5, 1583.6, 1635.1, 1646.0, 1659.0, 1675.8, 1747.8, 2105.2, 2136.6, 2304.1, 2620.2, 2860.3, 2978.6, 3419.2, 3448.7, 3473.3, 3767.6, 3794.4, 3829.1, 4111.4, 4122.3, 4239.7, 4638.3, 4770.4, 5133.7, 5341.5, 5366.5, 5461.3, 5489.3 and 5841.8 from 1970Jo04.
Observed deexcitation intensity from the capture state is 84% of g.s. feeding.
γγ coin information is from 1970Jo04 as shown by 1984Vo01.

$\gamma\gamma(\theta)$ results (1988Se06)

Level	γ_1	(γ)	γ_2	A_2	A_4	A_2 (if A4=0)
1644	843		770	-0.04 *7*	+0.09 *10*	-0.01*6*
1959	1159		770	-0.072 *22*	+0.03 *3*	-0.06 *20*
2047	1247		770	-0.09 *4*	+0.05 *6*	-0.08*4*
2104	1304		770	+0.18 *6*	-0.14 *8*	+0.14*6*
2419	1619		770	-0.09 *6*	+0.09 *8*	-0.06*5*
2626	522	(1304)	770	-0.10 *15*	-0.18 *21*	-0.16*13* a
2626	522		1304	-0.03 *21*	+0.5 *3*	+0.10*19*

2626	522	2074	-0.12 *15*	-0.03 *22*	-0.13*14*	
2808	2008	770	-0.09 *10*	+0.18 *14*	-0.03*9*	
3439	1480	1159	+0.05 *11*	+0.04 *16*	+0.06*10*	
3439	1480 (1159)	770	+0.07 *11*	-0.05 *16*	+0.05*10*	a
7800	4360	1480	+0.34 *16*	-0.16 *21*	+0.30*16*	
7800	5173	522	+0.04 *13*	-0.10 *18*	+0.01*12*	
7800	5380	1619	+0.32 *5*	+0.01 *6*	+0.32*5*	
7800	5380 (1619)	770	-0.01 *3*	0.00 *5*	-0.01*3*	a
7800	5509	646	+0.17 *7*	+0.03 *9*	+0.18*6*	
7800	5695	1304	-0.21 *9*	+0.14 *14*	-0.17*8*	
7800	5695	2074	+0.09 *7*	0.00 *9*	+0.09*6*	
7800	5752	1247	-0.13 *7*	-0.02 *10*	-0.14*6*	
7800	5752 (1247)	770	+0.04 *8*	-0.11 *11*	0.00*7*	a
7800	5752	2018	-0.1 *4*	+0.1 *3*	+0.06*21*	
7800	5752	2047	-0.19 *14*	-0.01 *20*	-0.20*12*	
7800	6999	770	-0.06 *5*	0.00 *8*	-0.06*5*	

a: triple $\gamma(\gamma)\gamma(\theta)$

γ(circ pol), $\gamma\gamma(\theta)$ results (1974Op01) for primary transitions

γ_1	Intermediate level	R	γ_2	Final level	A_2	F
3546	4254	+0.49 *10*				
4360	3439	+0.98 *9*				
5380	2419	0.00 *3*	1619	800	+0.19 *2*	0.96 *2*d
5509	2290	+0.70 *6*				
5695	2104	-0.41 *4*	2074	30	+0.05 *2*	d
5695	2104		1304	800	-0.13 *2*	
5729	2070	-0.46 *5*	2070	0	+0.07 *6*	1
5729	2070		2040	30	-0.20 *2*	
5729	2070		1178	800		
5752	2047	+0.08 *3*	2047	0	-0.09 *2*	0.02 *1*d
5752	2047		2017	30	+0.08 *2*	
5752	2047		1247	800	-0.21 *1*	
6999	801	+0.63 *6*				0.09 *4* c,091 *4*
7769	30	-0.50 *3* e				1

R: γ(circ pol) coefficient
F: fraction of 2+ component in ^{40}K capture state
c: constructive interference. d: destructive interference
e: -0.48 *16* (1970Ei03)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	$E\gamma^\dagger$	$I\gamma^\dagger$	Mult.	$\delta^\ddagger$
Unplaced				444.43 *8*	0.037 *5*		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[†]	Mult.	δ[‡]
				554.741 *23*	0.133 *17*		
				558.73 *10*	0.044 *7*		
				569.98 *7*	0.062 *8*		
				616.43 *6*	0.096 *11*		
				666.91 *5*	0.057 *6*		
				783.82 *4*	0.103 *11*		
				791.06 *4*	0.50 *5*		
				869.97 *4*	0.143 *15*		
				915.38 *16*	0.017 *3*		
				926.24 *15*	0.019 *4*		
				971.74 *19*	0.028 *5*		
				976.85 *6*	0.109 *12*		
				1018.11 *4*	0.141 *15*		
				1031.1 *3*	0.020 *5*		
				1043.58 *12*	0.023 *3*		
				1058.03 *4*	0.112 *12*		
				1096.72 *7*	0.101 *11*		
				1110.50 *7*	0.114 *12*		
				1172.20 *11*	0.042 *5*		
				1201.86 *5*	0.106 *11*		
				1204.36 *10*	0.046 *6*		
				1213.53 *8*	0.047 *5*		
				1219.47 *11*	0.041 *5*		
				1226.31 *5*	0.071 *8*		
				1255.29 *9*	0.107 *12*		
				1283.3 *3*	0.051 *16*		
				1331.58 *4*	0.152 *16*		
				1365.06 *24*	0.066 *12*		
				1377.16 *11*	0.122 *16*		
				1402.73 *9*	0.125 *14*		
				1416.67 *9*	0.048 *6*		
				1419.01 *3*	0.233 *24*		
				1449.98 *6*	0.047 *5*		
				1452.39 *12*	0.0200 *20*		
				1454.90 *10*	0.025 *3*		
				1460.81 *10*	0.049 *6*		
				1473.66 *16*	0.036 *5*		
				1483.86 *8*	0.077 *9*		
				1517.10 *9*	0.122 *14*		
				1521.02 *21*	0.059 *9*		
				1536.84 *5*	0.26 *3*		
				1562.78 *7*	0.31 *3*		
				1566.21 *7*	0.155 *17*		
				1625.67 *14*	0.32 *4*		
				1667.69 *5*	0.102 *11*		
				1680.8 *4*	0.010 *3*		
				1702.35 *3*	0.33 *3*		
				1710.19 *24*	0.023 *4*		
				1754.72 *17*	0.036 *5*		
				1811.2 *3*	0.032 *6*		
				1832.01 *5*	0.117 *12*		
				1854.99 *5*	0.202 *21*		
				1892.0 *3*	0.037 *5*		
				1901.6 *4*	0.029 *5*		
				1910.70 *6*	0.171 *18*		
				1994.08 *15*	0.188 *24*		
				2014.24 *11*	0.201 *23*		
				2067.53 *11*	0.28 *3*		
				2122.02 *5*	0.121 *13*		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ †	I_γ †	Mult.	δ‡
				2131.66 *17*	0.036 *5*		
				2173.67 *8*	0.094 *10*		
				2204.08 *10*	0.34 *4*		
				2271.19 *12*	0.085 *10*		
				2310.70 *5*	0.51 *5*		
				2322.75 *13*	0.127 *14*		
				2330.16 *10*	0.28 *3*		
				2373.74 *5*	0.102 *11*		
				2375.85 *5*	0.113 *12*		
				2384.99 *11*	0.141 *15*		
				2393.84 *12*	0.108 *12*		
				2416.06 *11*	0.194 *23*		
				2424.66 *5*	0.54 *6*		
				2448.11 *17*	0.045 *6*		
				2450.5 *3*	0.031 *5*		
				2459.48 *5*	0.191 *20*		
				2471.5 *3*	0.025 *4*		
				2518.8 *3*	0.045 *7*		
				2539.87 *7*	0.27 *3*		
				2542.92 *6*	0.77 *8*		
				2552.64 *17*	0.020 *3*		
				2557.03 *13*	0.027 *4*		
				2564.89 *19*	0.055 *7*		
				2572.08 *11*	0.113 *13*		
				2586.06 *14*	0.094 *11*		
				2589.23 *11*	0.146 *16*		
				2604.0 *4*	0.12 *3*		
				2627.7 *3*	0.18 *3*		
				2659.7 *4*	0.098 *20*		
				2668.8 *4*	0.107 *20*		
				2680.4 *5*	0.073 *19*		
				2688.1 *4*	0.19 *5*		
				2697.6 *3*	0.144 *22*		
				2775.21 *17*	0.27 *3*		
				2839.71 *7*	1.87 *10*		
				2857.15 *15*	0.29 *3*		
				2892.19 *15*	0.36 *3*		
				2897.9 *7*	0.061 *20*		
				2917.81 *9*	0.89 *5*		
				2949.23 *15*	0.63 *4*		
				2992.60 *14*	0.50 *3*		
				3000.4 *3*	0.133 *17*		
				3034.43 *17*	0.293 *24*		
				3133.49 *14*	0.51 *4*		
				3204.7 *4*	0.101 *20*		
				3214.12 *24*	0.223 *24*		
				3255.9 *4*	0.37 *7*		
				3429.8 *7*	0.09 *3*		
				3578.2 *3*	0.070 *12*		
				3743.2 *3*	0.21 *3*		
				3764.84 *19*	0.180 *17*		
				3822.17 *13*	0.264 *19*		
				3899.0 *7*	0.32 *11*		
				3989.07 *14*	0.242 *19*		
				4008.1 *3*	0.139 *15*		
				4086.13 *9*	0.46 *3*		
				4421.15 *14*	0.294 *22*		
				4667.0 *4*	0.110 *21*		
				4851.16 *25*	0.120 *13*		

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.	δ‡
				4912.4 *7*	0.044 *11*		
				4929.3 *3*	0.183 *21*		
				5188.8 *3*	0.053 *6*		
				5216.9 *6*	0.020 *4*		
				5228.86 *24*	0.057 *5*		
				6067.6 *3*	0.050 *5*		
29.8299	3-	0.0	4-	29.8299 *5*	86 *7*[k]	M1(+E2)	≤0.073[h]
521.7		0.0	4-	521.7[g]			
800.1427	2-	29.8299	3-	770.3053 *18*	43 *4*	M1(+E2)	+0.04 *+3-6*[h]
		0.0	4-	800.3 *3*[l]	0.063 *7*[l]		
891.398	5-	29.8299	3-	862.2 *3*[l]	0.012 *3*[l]		
		0.0	4-	891.372 *21*	0.90 *9*		
1084.3		800.1427	2-	284.1[g]			
1173.4		29.8299	3-	1143.5[g]			
1228.2		29.8299	3-	1198.3[g]			
1248.4		0.0	4-	1248.4[g]			
1330.5		0.0	4-	1330.5[g]			
1409.2		0.0	4-	1409.2[g]			
1520.7		800.1427	2-	720.5[g]			
1556.6		800.1427	2-	756.4[g]			
1643.639	0+	800.1427	2-	843.478 *16*	1.57 *16*		
		29.8299	3-	1613.84 *4*	5.7 *6*		
1877.7		800.1427	2-	1077.5[g]			
1959.068	2+	800.1427	2-	1158.901 *20*	7.8 *8*		
		29.8299	3-	1929.34 *10*	1.8 *3*		
2047.354	2-	800.1427	2-	1247.173 *24*	3.8 *4*	M1+E2	+0.10 *4*
		29.8299	3-	2017.53 *4*	2.7 *3*	M1+E2	+0.07 *4*[j]
		0.0	4-	2047.28 *4*	2.7 *3*	E2	
2069.809	3-	891.398	5-	1178.38 *4*	0.36 *4*		
		800.1427	2-	1269.56 *5*	0.47 *5*		
		29.8299	3-	2039.94 *4*	2.7 *3*	M1(+E2)	+0.2 *2*
		0.0	4-	2070.08 *15*	2.01 *20*	M1(+E2)	+0.01 *10*
2076.1		0.0	4-	2076.1[g]			
2103.668	1-	1643.639	0+	460.092 *14*[l]	0.136 *15*[l]		
		800.1427	2-	1303.53 *7*	2.7 *3*	M1(+E2)	+0.13 *8*[h]
		29.8299	3-	2073.74 *10*	6.5 *7*		
2260.40	3+	29.8299	3-	2230.54 *5*	0.81 *8*		
		0.0	4-	2260.11 *10*	0.31 *3*		
2271.1		29.8299	3-	2241.2[g]			
2289.871	1+	2103.668	1-	185.97 *10*[l]	0.118 *19*[l]		
		1959.068	2+	330.798 *7*	0.33 *3*		
		1643.639	0+	646.223 *5*	2.10 *12*		
		800.1427	2-	1489.77 *5*	1.21 *12*		
2290.493	3-	891.398	5-	1399.03 *4*	0.53 *5*		
		0.0	4-	2290.58 *7*	2.8 *3*		
2397.165	4-	2069.809	3-	327.23 *8*	0.062 *8*		
		29.8299	3-	2367.17 *5*	0.58 *6*		
		0.0	4-	2397.12 *6*	0.224 *23*		
2419.171	2-	2103.668	1-	315.52 *8*[l]	0.062 *8*[l]		
		2069.809	3-	349.33 *4*	0.053 *7*		
		2047.354	2-	371.792 *10*[l]	0.172 *18*[l]		
		1959.068	2+	460.092 *14*[l]	0.136 *15*[l]		
		800.1427	2-	1619.00 *4*	6.2 *6*	M1+E2	+0.24 *6*[hi]
		29.8299	3-	2389.18 *5*	1.34 *13*		
		0.0	4-	2418.69 *15*	0.63 *6*		
2422.1		0.0	4-	2422.1[g]			
2575.93	2+	2260.40	3+	315.52 *8*[l]	0.062 *8*[l]		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.	δ‡
		2047.354	2-	528.76 *14*[l]	0.017 *3*[l]		
		29.8299	3-	2545.85 *10*	2.8 *3*		
2618.1		800.1427	2-	1817.9[g]			
2625.990	0-	2103.668	1-	522.319 *7*	1.53 *16*		
		800.1427	2-	1825.77 *5*	0.65 *7*		
2730.372	1	2419.171	2-	311.13 *4*	0.133 *5*		
		2103.668	1-	626.1 *3*[l]	0.010 *3*[l]		
		1643.639	0+	1086.707 *19*	1.11 *11*		
		800.1427	2-	1930.2 *3*	0.5 *3*		
2746.91	(2,3)-	800.1427	2-	1946.43 *17*	0.040 *6*		
		29.8299	3-	2716.95 *11*	0.50 *4*		
		0.0	4-	2747.00 *18*	0.26 *3*		
2756.72	2+	2419.171	2-	337.75 *12*	0.036 *6*		
		1643.639	0+	1113.3 *3*	0.029 *5*		
		800.1427	2-	1956.58 *5*	1.84 *18*		
		29.8299	3-	2726.62 *7*	1.58 *9*		
2786.644	3+	2290.493	3-	496.06 *4*	0.047 *5*		
		1959.068	2+	827.552 *15*	0.45 *5*		
		29.8299	3-	2756.81 *7*	1.93 *10*		
		0.0	4-	2787.0 *6*	0.14 *5*		
2807.88	(1,2)-	2047.354	2-	760.6 *4*	0.12 *4*		
		1959.068	2+	848.7 *3*[l]	0.104 *19*[l]		
		800.1427	2-	2007.71 *4*	2.5 *3*		
2925.1		800.1427	2-	2124.9[g]			
		0.0	4-	2925.1[g]			
2939.2		800.1427	2-	2139.0[g]			
2946.2		29.8299	3-	2916.3[g]			
2985.87	(2-,3+)	2290.493	3-	695.31 *8*[l]	0.042 *6*[l]		
		1959.068	2+	1027.09 *24*	0.036 *8*		
		800.1427	2-	2185.70 *20*	0.47 *24*		
		29.8299	3-	2955.94 *16*	0.41 *3*		
3000.0		800.1427	2-	2199.8[g]			
3027.95	2-	2290.493	3-	737.45 *3*	0.146 *15*		
		2069.809	3-	958.35 *9*	0.026 *3*		
		1959.068	2+	1068.87 *3*[l]	0.40 *4*[l]		
		0.0	4-	3027.7 *3*	0.139 *18*		
3063.5		800.1427	2-	2263.4[g]			
		0.0	4-	3063.5[g]			
3093.8		29.8299	3-	3063.9[g]			
3109.721	(1,2)+	2575.93	2+	534.3 *3*[l]	0.009 *3*[l]		
		2260.40	3+	848.7 *3*[l]	0.104 *19*[l]		
		2047.354	2-	1062.20 *8*	0.052 *6*		
		1959.068	2+	1150.58 *18*	0.23 *4*		
		1643.639	0+	1466.11 *3*	0.26 *3*		
3128.36	2-	2807.88	(1,2)-	320.9 *6*	0.009 *5*		
		2756.72	2+	371.792 *10*[l]	0.172 *18*[l]		
		2289.871	1+	838.8 *5*	0.066 *17*		
		29.8299	3-	3098.56 *20*	0.37 *14*		
		0.0	4-	3128.06 *13*	0.61 *4*		
3140.7		0.0	4-	3140.7[g]			
3146.44	1	2419.171	2-	727.1 *3*[l]	0.014 *3*[l]		
		1959.068	2+	1187.45 *8*	0.062 *7*		
		1643.639	0+	1503.00 *10*	0.41 *4*		
		800.1427	2-	2346.05 *10*	0.69 *7*		
3153.81	(2,3)-	2756.72	2+	397.28 *17*	0.030 *7*		
		2397.165	4-	756.4 *6*[l]	0.08 *4*[l]		
		1643.639	0+	1509.9 *3*[l]	0.022 *4*[l]		

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ †	I_γ †	Mult.	δ‡
		0.0	4-	3153.5 *3*	0.38 *3*		
3228.67	2-	2289.871	1+	938.72 *6*	0.098 *11*		
		2103.668	1-	1124.91 *6*[l]	0.120 *13*[l]		
		800.1427	2-	2428.28 *9*	0.25 *3*		
		29.8299	3-	3198.6 *3*	0.146 *22*		
		0.0	4-	3229.4 *4*	0.128 *21*		
3305.2		800.1427	2-	2505.0[g]			
3326.6		800.1427	2-	2526.5[g]			
		0.0	4-	3326.6[g]			
3368.03	(2,3)-	2746.91	(2,3)-	620.96 *7*[l]	0.070 *8*[l]		
		2047.354	2-	1320.9 *4*	0.30 *3*		
		800.1427	2-	2568.8 *4*[l]	0.033 *6*[l]		
		29.8299	3-	3336.3 *10*	1.7 *8*		
		0.0	4-	3368.9 *6*	0.10 *3*		
3373.4		800.1427	2-	2573.2[g]			
3393.63	2-	1959.068	2+	1434.50 *6*	0.140 *15*		
		800.1427	2-	2593.32 *10*	0.50 *5*		
3414.34	2+	3228.67	2-	185.97 *10*[l]	0.118 *19*[l]		
		2786.644	3+	627.66 *3*	0.095 *10*		
		1643.639	0+	1771.4 *5*[l]	0.031 *9*[l]		
		800.1427	2-	2614.21 *9*	1.16 *7*		
		29.8299	3-	3384.66 *24*	0.40 *5*		
3428.9		0.0	4-	3428.9[g]			
3439.144	(2+)	2625.990	0-	813.12 *7*[l]	0.046 *6*[l]		
		2103.668	1-	1335.48 *18*	0.033 *6*		
		1959.068	2+	1480.09 *4*	1.54 *16*	M1(+E2)	+0.22 *22*[h]
		1643.639	0+	1795.45 *4*	1.34 *14*		
		800.1427	2-	2638.93 *11*	1.04 *7*		
3486.21	2-	3109.721	(1,2)+	376.53 *3*	0.031 *4*		
		2807.88	(1,2)-	678.13 *20*[l]	0.027 *5*[l]		
		2730.372	1	756.4 *6*[l]	0.08 *4*[l]		
		2290.493	3-	1195.81 *7*	0.055 *6*		
		2047.354	2-	1438.72 *4*	0.218 *23*		
		800.1427	2-	2685.6 *3*[l]	0.24 *5*[l]		
3517.7		0.0	4-	3517.7[g]			
3528.4		800.1427	2-	2728.2[g]			
3556.97	(1- to 4+)	3027.95	2-	528.76 *14*[l]	0.017 *3*[l]		
		2756.72	2+	800.3 *3*[l]	0.063 *7*[l]		
		2575.93	2+	981.03 *7*[l]	0.103 *12*[l]		
		2289.871	1+	1267.5 *3*[l]	0.105 *21*[l]		
		2069.809	3-	1487.42 *9*[l]	0.097 *12*[l]		
		2047.354	2-	1509.9 *3*[l]	0.022 *4*[l]		
		1959.068	2+	1597.88 *4*	0.29 *3*		
		800.1427	2-	2755.2[g]			
		29.8299	3-	3526.99 *10*	1.02 *7*		
3578.3		800.1427	2-	2778.1[g]			
3599.24	2-	2985.87	(2-,3+)	613.384 *24*	0.203 *23*		
		2575.93	2+	1023.21 *4*	0.26 *3*		
		2289.871	1+	1308.9 *4*[l]	0.043 *17*[l]		
		2290.493	3-	1308.9 *4*[l]	0.043 *17*[l]		
		2047.354	2-	1551.77 *9*	0.102 *12*		
		800.1427	2-	2799.30 *18*	0.95 *10*		
		29.8299	3-	3569.30 *8*	0.45 *3*		
3629.95	2-,3-	3027.95	2-	602.26 *17*	0.034 *6*		
		2397.165	4-	1232.74 *3*	0.134 *14*		
		2069.809	3-	1560.44 *19*	0.175 *21*		
		29.8299	3-	3599.62 *20*	0.185 *19*		

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.	δ‡
		0.0	4-	3629.94 *15*	0.33 *3*		
3655.6		800.1427	2-	2855.4[g]			
3663.739	(3,4)+	3128.36	2-	534.3 *3*[l]	0.009 *3*[l]		
		2985.87	(2-,3+)	678.13 *20*[l]	0.027 *5*[l]		
		2290.493	3-	1373.227 *21*	1.29 *13*		
		1959.068	2+	1704.73 *9*	0.94 *12*		
		29.8299	3-	3633.88 *9*	0.63 *4*		
		0.0	4-	3663.32 *9*	0.44 *3*		
3709.5		800.1427	2-	2909.3[g]			
3719.6		800.1427	2-	2919.4[g]			
3738.48	1+	2575.93	2+	1162.59 *24*[l]	0.31 *5*[l]		
		2260.40	3+	1478.01 *6*	0.32 *3*		
		2047.354	2-	1691.26 *6*	0.111 *12*		
		1643.639	0+	2094.61 *10*	0.048 *5*		
		800.1427	2-	2938.32 *9*	0.67 *4*		
3767.79	(≤ 3)-	3146.44	1	620.96 *7*[l]	0.070 *8*[l]		
		3128.36	2-	640.4 *6*[l]	0.044 *22*[l]		
		2786.644	3+	981.03 *7*[l]	0.103 *12*[l]		
		2419.171	2-	1348.06 *14*[l]	0.035 *4*[l]		
		800.1427	2-	2967.8 *3*	0.163 *19*		
3797.57	1+	3414.34	2+	383.01 *18*	0.020 *4*		
		2985.87	(2-,3+)	811.39 *13*	0.023 *4*		
		2575.93	2+	1221.71 *7*	0.067 *7*		
		1959.068	2+	1838.61 *8*	0.44 *4*		
		1643.639	0+	2153.81 *4*	0.79 *8*		
3807.8		800.1427	2-	3007.6[g]			
3821.43	2-	3486.21	2-	335.44 *14*[l]	0.040 *6*[l]		
		2786.644	3+	1034.28 *20*[l]	0.038 *6*[l]		
		2746.91	(2,3)-	1074.39 *9*	0.144 *17*		
		2730.372	1	1090.9 *3*	0.037 *9*		
		2397.165	4-	1424.229 *23*	0.36 *4*		
		2290.493	3-	1530.7 *3*	0.058 *14*		
		29.8299	3-	3791.9 *3*	0.18 *3*		
		0.0	4-	3820.5[g]			
3840.228	(1,2+)	3109.721	(1,2)+	730.48 *15*	0.024 *4*		
		2069.809	3-	1771.4 *5*[l]	0.031 *9*[l]		
		1959.068	2+	1881.20 *5*	0.50 *5*		
		1643.639	0+	2196.61 *5*	0.34 *4*		
		800.1427	2-	3040.24 *13*	0.62 *4*		
3856.4		800.1427	2-	3056.2[g]			
3868.66	2-	3414.34	2+	454.19 *8*	0.038 *5*		
		3228.67	2-	640.4 *6*[l]	0.044 *22*[l]		
		2746.91	(2,3)-	1121.77 *7*	0.111 *12*		
		2289.871	1+	1578.97 *12*	0.035 *4*		
		2103.668	1-	1765.24 *15*	0.224 *23*		
		800.1427	2-	3068.7 *4*	0.25 *4*		
		29.8299	3-	3838.50 *7*	0.62 *4*		
		0.0	4-	3868.3 *10*	0.12 *5*		
3887.92	(1-,2,3)	2756.72	2+	1131.17 *5*	0.103 *11*		
		800.1427	2-	3088.3 *5*	0.19 *4*		
		29.8299	3-	3857.97 *11*	0.305 *21*		
3923.90	(1- to 4+)	3738.48	1+	185.97 *10*[l]	0.118 *19*[l]		
		3228.67	2-	695.31 *8*[l]	0.042 *6*[l]		
		2575.93	2+	1348.06 *14*[l]	0.035 *4*[l]		
		2103.668	1-	1820.35 *5*[l]	0.27 *3*[l]		
		1959.068	2+	1964.27 *23*	0.037 *6*		
		29.8299	3-	3895.7 *11*	0.21 *11*		

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.	δ‡
3933.0		800.1427	2-	3132.8[g]			
4020.35	(≤ 3)-	3486.21	2-	534.3 *3*[l]	0.009 *3*[l]		
		3393.63	2-	626.1 *3*[l]	0.010 *3*[l]		
		2985.87	(2-,3+)	1034.28 *20*[l]	0.038 *6*[l]		
		2103.668	1-	1916.51 *6*	0.26 *3*		
		2047.354	2-	1973.00 *4*	0.32 *3*		
		800.1427	2-	3220.08 *21*	0.24 *3*		
4058.3		800.1427	2-	3258.1[g]			
4104.46	(1-,2,3-)	3663.739	(3,4)+	440.77 *7*	0.047 *7*		
		3599.24	2-	504.5 *5*	0.062 *18*		
		2985.87	(2-,3+)	1118.38 *13*	0.054 *7*		
		2756.72	2+	1348.06 *14*[l]	0.035 *4*[l]		
		2290.493	3-	1813.94 *14*	0.072 *9*		
		2103.668	1-	2001.24 *20*	0.137 *20*		
		2047.354	2-	2057.07 *5*	0.141 *16*		
		800.1427	2-	3304.24 *11*	0.99 *7*		
4110.84	(1-,2,3)	3109.721	(1,2)+	1001.05 *5*	0.081 *9*		
		3027.95	2-	1082.92 *7*	0.200 *22*		
		2985.87	(2-,3+)	1124.91 *6*[l]	0.120 *13*[l]		
		2756.72	2+	1354.12 *3*	0.161 *7*		
		2290.493	3-	1820.35 *5*[l]	0.27 *3*[l]		
		1643.639	0+	2467.31 *10*[l]	0.067 *7*[l]		
		800.1427	2-	3310.9 *5*	0.12 *3*		
		29.8299	3-	4080.69 *12*	0.325 *22*		
		0.0	4-	4110.6[g]			
4149.01	(2-,3)	3393.63	2-	756.4 *6*[l]	0.08 *4*[l]		
		3228.67	2-	920.12 *18*[l]	0.017 *3*[l]		
		2985.87	(2-,3+)	1162.59 *24*[l]	0.31 *5*[l]		
		2397.165	4-	1751.76 *5*	0.225 *23*		
		2290.493	3-	1858.51 *5*	0.54 *5*		
		2260.40	3+	1888.43 *8*	0.098 *11*		
		800.1427	2-	3348.91 *10*	1.12 *7*		
		29.8299	3-	4118.5[g]			
		0.0	4-	4148.4 *3*	0.134 *18*		
4165.4		29.8299	3-	4135.6[g]			
		0.0	4-	4165.4[g]			
4180.03	(3-)	3439.144	(2+)	740.89 *6*	0.26 *3*		
		3228.67	2-	951.16 *7*	0.043 *5*		
		2786.644	3+	1393.16 *8*	0.126 *14*		
		2419.171	2-	1761.10 *7*[l]	0.030 *4*[l]		
		1959.068	2+	2221.27 *11*[ab]	0.183 *24*		
		891.398	5-	3286.4 *8*	0.15 *5*		
4213.07	(2-,3+)	3486.21	2-	727.1 *3*[l]	0.014 *3*[l]		
		3414.34	2+	798.8 *3*[l]	0.062 *7*[l]		
		2069.809	3-	2143.37 *11*	0.139 *16*		
		1643.639	0+	2568.8 *4*[l]	0.033 *6*[l]		
4253.62	1-	3153.81	(2,3)-	1100.13 *18*	0.042 *6*		
		3128.36	2-	1124.91 *6*[l]	0.120 *13*[l]		
		2985.87	(2-,3+)	1267.5 *3*[l]	0.105 *21*[l]		
		2103.668	1-	2149.93 *5*	0.43 *4*		
		2069.809	3-	2183.70 *20*	0.47 *24*		
		2047.354	2-	2206.35 *10*[l]	0.75 *8*[l]		
		1643.639	0+	2609.98 *9*	1.40 *9*		
		800.1427	2-	3452.2 *10*	1.71 *10*		
		29.8299	3-	4223.66 *7*	0.83 *5*		
4280.52	2-	2575.93	2+	1704.70 *20*	0.31 *16*		
		2047.354	2-	2233.0 *4*	0.16 *16*		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.	δ‡
		800.1427	2-	3480.6 *5*	0.13 *3*		
		29.8299	3-	4249.5 *4*	0.119 *16*		
		0.0	4-	4280.35 *22*	0.37 *4*		
4395.88	(0,1,2)-	3738.48	1+	657.39 *3*	0.078 *8*		
		3128.36	2-	1267.5 *3*[l]	0.105 *21*[l]		
		2730.372	1	1665.43 *4*	0.143 *15*		
		2047.354	2-	2348.72 *9*[ac]	0.24 *3*		
4419.36	(2-,3,4+)	3663.739	(3,4)+	756.4 *6*[l]	0.08 *4*[l]		
		3556.97	(1- to 4+)	862.2 *3*[l]	0.012 *3*[l]		
		3153.81	(2,3)-	1265.54 *9*	0.199 *23*		
		3109.721	(1,2)+	1308.9 *4*[l]	0.043 *17*[l]		
		2575.93	2+	1843.33 *9*	0.065 *7*		
		2397.165	4-	2022.32 *17*	0.165 *23*		
		29.8299	3-	4389.32 *18*	0.37 *3*		
4472.99	(2,3)-	3439.144	(2+)	1034.28 *20*[l]	0.038 *6*[l]		
		3393.63	2-	1079.44 *13*	0.100 *13*		
		2985.87	(2-,3+)	1487.42 *9*[l]	0.097 *12*[l]		
		2746.91	(2,3)-	1725.68 *17*[l]	0.033 *5*[l]		
		2625.990	0-	1846.72 *6*[l]	0.105 *11*[l]		
		2069.809	3-	2403.04 *9*	0.119 *13*		
		0.0	4-	4472.80 *11*	0.40 *3*		
4537.06	2-	3738.48	1+	798.8 *3*[l]	0.062 *7*[l]		
		3228.67	2-	1308.9 *4*[l]	0.043 *17*[l]		
		3109.721	(1,2)+	1427.45 *18*	0.022 *3*		
		2575.93	2+	1961.11 *6*	0.154 *16*		
		2069.809	3-	2467.31 *10*[l]	0.067 *7*[l]		
		1959.068	2+	2577.63 *10*	0.32 *3*		
		800.1427	2-	3737.01 *10*	1.14 *7*		
		29.8299	3-	4506.96 *7*	0.77 *5*		
4744.093	(2+)	4180.03	(3-)	563.86 *6*[ad]	0.073 *9*		
		4104.46	(1-,2,3-)	640.4 *6*[l]	0.044 *22*[l]		
		3840.228	(1,2+)	903.878 *23*	0.150 *15*		
		3797.57	1+	946.29 *8*	0.037 *4*		
		3599.24	2-	1144.7 *5*	0.08 *3*		
		2807.88	(1,2)-	1935.7 *3*	0.125 *22*		
		2730.372	1	2013.90 *20*	0.17 *3*		
		2575.93	2+	2168.16 *4*	0.179 *19*		
		2289.871	1+	2454.7 *3*	0.025 *4*		
		2260.40	3+	2483.8 *3*	0.029 *8*		
		1959.068	2+	2784.4 *4*	0.21 *5*		
		1643.639	0+	3100.42 *20*	0.37 *14*		
		800.1427	2-	3943.81 *6*	0.98 *5*		
4788.65	(1+)	4472.99	(2,3)-	315.52 *8*[l]	0.062 *8*[l]		
		4253.62	1-	534.3 *3*[l]	0.009 *3*[l]		
		4149.01	(2-,3)	640.4 *6*[l]	0.044 *22*[l]		
		4110.84	(1-,2,3)	678.13 *20*[l]	0.027 *5*[l]		
		3868.66	2-	920.12 *18*[l]	0.017 *3*[l]		
		3663.739	(3,4)+	1124.9 *6*[l]	0.120 *13*[l]		
		3027.95	2-	1761.10 *17*[l]	0.030 *4*[l]		
		2756.72	2+	2031.6 *3*	0.26 *4*		
		2625.990	0-	2162.16 *17*	0.041 *5*		
		2260.40	3+	2528.44 *11*	0.139 *15*		
		2103.668	1-	2685.6 *3*[l]	0.24 *5*[l]		
		1643.639	0+	3144.30 *19*[ae]	0.28 *3*		
4872.55	(2,3)-	4537.06	2-	335.44 *14*[l]	0.040 *6*[l]		
		3153.81	(2,3)-	1718.68 *4*	0.166 *7*		

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ†	I_γ†	Mult.	δ‡
		3146.44	1	1725.68 *17*[l]	0.033 *5*[l]		
		2756.72	2+	2115.77 *14*	0.031 *4*		
		1959.068	2+	2912.6 *3*	0.145 *21*		
		29.8299	3-	4842.8 *4*	0.076 *12*		
		0.0	4-	4872.47 *14*	0.252 *19*		
4906.9		800.1427	2-	4106.7[g]			
		0.0	4-	4906.9[g]			
4992.94	(2-,3+)	4180.03	(3-)	813.12 *7*[l]	0.046 *6*[l]		
		3923.90	(1- to 4+)	1068.87 *3*[l]	0.40 *4*[l]		
		3146.44	1	1846.72 *6*[l]	0.105 *11*[l]		
		2786.644	3+	2206.35 *10*[l]	0.75 *8*[l]		
		2290.493	3-	2702.60 *16*	0.28 *3*		
		2069.809	3-	2922.91 *20*	0.33 *3*		
		29.8299	3-	4962.2 *4*	0.107 *19*		
		0.0	4-	4993.9[g]			
5063.47	(2-,3+)	3368.03	(2,3)-	1695.44 *8*	0.100 *11*		
		3109.721	(1,2)+	1953.74 *6*	0.31 *3*		
		2419.171	2-	2644.0 *3*	0.26 *4*		
		0.0	4-	5062.9 *4*	0.070 *9*		
6311		0.0	4-	6310.9[g]			
7799.534	1+,2+	5063.47	(2-,3+)	2736.09 *9*	0.83 *5*		
		4992.94	(2-,3+)	2806.53 *12*	1.76 *13*		
		4872.55	(2,3)-	2926.85 *10*	0.73 *5*		
		4788.65	(1+)	3010.55 *14*	0.50 *3*		
		4744.093	(2+)	3055.58 *12*	2.86 *17*		
		4537.06	2-	3262.56 *12*	2.43 *17*		
		4472.99	(2,3)-	3326.44 *12*	0.79 *6*		
		4419.36	(2-,3,4+)	3380.3 *4*	0.22 *4*		
		4395.88	(0,1,2)-	3403.59 *11*	1.00 *7*		
		4280.52	2-	3518.85 *10*	1.05 *7*		
		4253.62	1-	3545.95 *6*[a f]	4.7 *3*		
		4213.07	(2-,3+)	3586.53 *13*	0.217 *17*		
		4180.03	(3-)	3619.40 *6*	0.77 *4*		
		4149.01	(2-,3)	3650.34 *5*	2.22 *11*		
		4110.84	(1-,2,3)	3688.67 *15*	1.49 *12*		
		4104.46	(1-,2,3-)	3695.15 *11*	1.43 *10*		
		4020.35	(≤ 3)-	3778.99 *10*	0.93 *6*		
		3923.90	(1- to 4+)	3874.7 *3*	0.28 *6*		
		3887.92	(1-,2,3)	3911.49 *18*	0.96 *9*		
		3868.66	2-	3930.64 *5*	1.56 *8*		
		3840.228	(1,2+)	3959.19 *5*	1.48 *8*		
		3821.43	2-	3977.83 *5*	1.29 *7*		
		3797.57	1+	4001.78 *5*	1.61 *9*		
		3767.79	(≤ 3)-	4031.58 *14*	0.221 *17*		
		3738.48	1+	4060.92 *5*	1.53 *8*		
		3663.739	(3,4)+	4135.58 *5*	3.41 *18*		
		3629.95	2-,3-	4169.31 *9*	0.71 *4*		
		3599.24	2-	4200.04 *5*	2.23 *12*		
		3556.97	(1- to 4+)	4242.47 *11*	0.45 *3*		
		3486.21	2-	4312.8 *3*	0.28 *4*		
		3439.144	(2+)	4360.19 *6*	4.33 *24*		
		3414.34	2+	4384.95 *7*	1.47 *8*		
		3393.63	2-	4405.36 *11*	0.42 *3*		
		3368.03	(2,3)-	4431.17 *16*	0.59 *5*		
		3146.44	1	4652.94 *8*	0.52 *3*		
		3128.36	2-	4670.84 *10*	0.66 *4*		
		3109.721	(1,2)+	4688.9 *5*	0.052 *11*		
		2939.2		4860.4[g]			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[†]	Mult.	δ[‡]
		2925.1		4874.5[g]			
		2807.88	(1,2)-	4991.38 *5*	2.18 *11*		
		2786.644	3+	5012.47 *6*	1.17 *6*		
		2756.72	2+	5042.43 *6*	1.78 *9*		
		2730.372	1	5068.65 *6*	1.25 *7*		
		2625.990	0-	5173.19 *5*	2.30 *12*		
		2618.1		5181.5[g]			
		2575.93	2+	5223.14 *7*	0.377 *20*		
		2422.1		5377.5[g]			
		2419.171	2-	5379.84 *6*	7.9 *4*		
		2289.871	1+	5509.12 *7*	3.17 *16*		
		2271.1		5528.5[g]			
		2103.668	1-	5695.38 *7*	5.6 *3*		
		2076.1		5723.5[g]			
		2069.809	3-	5729.21 *7*	2.28 *12*		
		2047.354	2-	5751.60 *7*	5.5 *3*		
		1877.7		5921.9[g]			
		1556.6		6243.0[g]			
		1520.7		6278.9[g]			
		1409.2		6390.4[g]			
		1330.5		6469.1[g]			
		1248.4		6551.2[g]			
		1228.2		6571.4[g]			
		1173.4		6626.2[g]			
		1084.3		6715.3[g]			
		800.1427	2-	6998.77 *10*	2.15 *11*		
		800.1427	2-	7001.1[g]			
		521.7		7277.9[g]			
		29.8299	3-	7768.75 *19*	5.6 *3*		

[†] From 1984Vo01. Extensive Eγ, Iγ data are also available from 1972Op01 and 1970Jo04, but are less precise, thus not considered here.
[‡] From (pol n,γ) (1974Op01), unless otherwise stated.
[a] Poor fit, the fitted energy deviates by about 3 times the quoted energy uncertainty.
[b] Level-energy difference=2220.89.
[c] Level-energy difference=2348.45.
[d] Level-energy difference=564.06.
[e] Level-energy difference=3144.87.
[f] Level-energy difference=3545.75.
[g] From $\gamma\gamma$ coin data of 2002Va28.
[h] From $\gamma\gamma(\theta)$ (1988Se06).
[i] Other: +0.06 *6* or +1.9 *3* (1974Op01).
[j] Or -9 *2* (1974Op01). Other: +0.25 *21* or $\leq$-8 (1988Se06).
[k] From total feeding of 29.8 level.
[l] Multiply placed with undivided intensity.

^{39}K(n,γ),(n,n):resonances 1984Ma40,1973Si32

1984Ma40: E=9.05-110 keV. Measured yields, deduced resonance parameters.
1973Si32 (also 1971SiYI): E=0-400 keV, natural K target. A total 35 resonances (8 tentative) assigned to ^{40}K, deduced resonance parameters.
Other:.
1958Go01: total neutron cross sections in keV region.
Most data are from 1984Ma40. See also evaluation by 1981MuZQ.

^{40}K Levels

E(level)†	Jπ‡	(2J+1)$\Gamma_n\Gamma_\gamma/\Gamma$	L#	E(n)(lab) (keV)	Comments
7800.58 *8*	(0 to 3)-	0.060 eV *4*	1	1.108 *1*	(2J+1)Γ_n=0.060 eV *4*.
7802.70 *8*	(0 to 3)-	0.522 eV *2*	1	3.281 *3*	(2J+1)Γ_n=0.400 eV *6*.
7808.65 *8*	1+	1.38 eV *2*	0	9.386 *9*	(2J+1)Γ_n=220 eV *20*; Γ_γ=0.463 eV *8*.
7811.36 *8*		0.330 eV *6*	1	12.159 *13*	
7811.81 *8*	3-	2.06 eV *1*	1	12.626 *13*	(2J+1)Γ_n=5.2 eV *12*; Γ_γ=0.488 eV *5*. Jπ: 1 (1973Si32).
7813.44 *8*	(0 to 3)-	0.94 eV *1*	1	14.30 *2*	(2J+1)Γ_n=3.2 eV *7*; Γ_γ=0.266 eV *5*.
7815.06 *8*	2-	1.20 eV *2*	1	15.96 *2*	(2J+1)Γ_n=6.8 eV *12*; Γ_γ=0.291 eV *4*.
7815.80 *8*	3	1.15 eV *2*		16.72 *2*	(2J+1)Γ_n=2.56 eV *8*; Γ_γ=0.30 eV.
7823.84 *9*		0.92 eV *2*		24.97 *3*	
7824.42 *9*	2+	1.97 eV *3*	0	25.56 *3*	(2J+1)Γ_n=474 eV *13*; Γ_γ=0.396 eV *7*. Jπ: 1 (1973Si32).
7827.15 *9*		0.18 eV *1*		28.36 *3*	
7830.72 *9*	3-	4.28 eV *7*	1	32.23 *3*	(2J+1)Γ_n=14 eV; Γ_γ=0.869 eV *19*. Jπ: 1 (1973Si32).
7832.02 *9*	2-	1.47 eV *7*	1	33.36 *3*	(2J+1)Γ_n=65 eV *4*; Γ_γ=0.301 eV *14*. Jπ: (1) (1973Si32).
7836.11 *9*		1.66 eV *5*	1	37.56 *3*	Jπ: 0 (1973Si32).
7836.21 *9*		1.56 eV *5*		37.66 *3*	
7841.00 *9*	2+	5.0 eV *2*	0	42.56 *4*	(2J+1)Γ_n=2.70 keV *13*; Γ_γ=0.97 eV *4*.
7843.50 *9*		0.92 eV *4*		45.14 *4*	
7844.38 *9*	2-	3.08 eV *8*	1	46.04 *5*	(2J+1)Γ_n=208 eV *8*; Γ_γ=0.626 eV *17*. Jπ: 1 (1973Si32).
7850.37 *9*	(0 to 3)-	1.76 eV *6*	1	52.19 *5*	(2J+1)Γ_n=64 eV *10*; Γ_γ=0.362 eV *13*.
7852.50 *9*		1.03 eV *5*		54.37 *5*	
7852.78 *10*	2-	2.09 eV *7*	1	54.65 *6*	(2J+1)Γ_n=80 eV *20*; Γ_γ=0.429 eV *15*. Jπ: 0 (1973Si32).
7853.28 *10*		1.07 eV *5*		55.16 *6*	
7853.93 *10*		0.85 eV *5*		55.83 *6*	
7855.86 *10*	1+	4.4 eV *4*	0	57.81 *6*	(2J+1)Γ_n=3.2 keV *3*; Γ_γ=1.47 eV *13*. Jπ: 2 (1973Si32).
7856.83 *10*		1.15 eV *6*		58.80 *6*	
7857.99 *10*	1-	0.61 eV *6*	1	59.99 *6*	(2J+1)Γ_n=0.25 keV *4*; Γ_γ=0.203 eV *21*.
7860.18 *10*		1.48 eV *7*		62.24 *6*	
7866.32 *11*	1	5.3 eV *6*	1	68.54 *7*	(2J+1)Γ_n=5.8 keV *7*; Γ_γ=1.78 eV *21*. L: for 68.54 and/or 68.81.
7866.59 *11*		1.47 eV *10*		68.81 *7*	
7873.32 *11*		0.43 eV *6*		75.72 *8*	
7878.12 *11*		2.23 eV *10*		80.64 *8*	
7878.63 *11*		1.40 eV *8*	(1)	81.17 *8*	Jπ: (1) (1973Si32).
7882.26 *11*		0.76 eV *7*		84.89 *8*	
7884.91 *12*	1-	0.85 eV *13*	1	87.60 *9*	(2J+1)Γ_n=1.40 keV *16*; Γ_γ=0.28 eV *4*.
7889.96 *12*		1.68 eV *14*	1	92.78 *9*	L: for 92.78 and/or 93.09.
7890.26 *12*		2.03 eV *14*		93.09 *9*	
7893.86 *13*		2.2 eV *2*	0	96.78 *10*	Jπ: 1 (1973Si32).
7894.38 *13*		2.2 eV *2*		97.31 *10*	
7896.38 *13*	2-	1.2 eV *2*	1	99.36 *10*	(2J+1)Γ_n=0.61 keV *13*; Γ_γ=0.24 eV *3*.
7899.3 *2*	(0 to 3)-	1.8 eV *2*	(1)	102.3 *2*	(2J+1)Γ_n=0.18 keV *5*; Γ_γ=0.36 eV *3*.
7900.5 *2*		1.7 eV *2*		103.5 *2*	
7901.3 *2*		2.4 eV *2*		104.4 *2*	
7903.1 *2*		0.92 eV *14*		106.2 *2*	

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^{40}K Levels (continued)

E(level)†	Jπ‡	(2J+1)$\Gamma_n\Gamma_\gamma/\Gamma$	L#	E(n)(lab) (keV)	Comments
7905.4 *2*		1.4 eV *2*		108.6 *2*	
7905.5 *2*	1+	2.7 eV *7*	0	108.7 *2*	(2J+1)Γ_n=6.0 keV *13*; Γ_γ=0.92 eV *24*.
7906.4 *2*		1.3 eV *2*		109.6 *2*	
7906.8 *2*		1.1 eV *2*		110.0 *2*	
7911.8 *3*		1.00 eV *12*		115.1 *3*	
7914.0 *3*		3.9 eV *6*		117.4 *3*	
7915.4 *3*	(0 to 3)-	1.02 eV *12*	(1)	118.8 *3*	(2J+1)Γ_n=0.31 keV *5*.
7916.6 *3*		1.6 eV *2*		120.1 *3*	
7918.3 *3*	(0 to 3)-	2.5 eV *2*	(1)	122.8 *3*	(2J+1)Γ_n=0.13 keV *4*; Γ_γ=0.50 eV *4*.
7922.6 *3*	2	3.2 eV *3*		126.2 *3*	(2J+1)Γ_n=0.21 keV *2*; Γ_γ=0.65 eV *6*.
7923.5 *3*		2.1 eV *2*		127.1 *3*	
7924.2 *3*		0.32 eV *16*		127.9 *3*	
7925.7 *3*		1.8 eV *2*		129.4 *3*	
7931.5 *3*		2.0 eV *3*	(1)	135.3 *3*	Jπ: (1,2) (1973Si32).
7932.1 *3*		2.9 eV *3*		136.0 *3*	
7932.7 *3*		5.2 eV *3*	(1)	136.6 *3*	L: for 136.0 and/or 136.6.
7940.0 *3*		11.6 eV *5*	(1)	144.1 *3*	S: doublet 1.9 eV 3. Jπ: 2 (1973Si32).
7941.0 *3*		2.9 eV *3*		145.1 *3*	
7943.1 *3*		2.6 eV *3*		147.2 *3*	
7943.9 *3*		2.0 eV *3*		148.1 *3*	
7947.7 *4*				152.0 *4*	
7949.6 *4*			(1)	153.9 *4*	(2J+1)Γ_n=6.4 keV *8*. Jπ: (3) (1973Si32).
7957.8 *4*			(1)	162.3 *4*	(2J+1)Γ_n=3.8 keV *4*. Jπ: 1,2 (1973Si32).
7972.7 *4*	1		(1)	177.6 *4*	(2J+1)Γ_n=3.4 keV *4*. Jπ: 1 (1973Si32).
7983.1 *5*	(0 to 3)-		1	188.3 *5*	(2J+1)Γ_n=0.84 keV *17*.
7987.8 *5*	1+		0	193.1 *5*	(2J+1)Γ_n=3.0 keV *6*.

† E(n)(c.m.)+S(n)(^{40}K), where S(n)(^{40}K)=7799.51 *7* (2003Au03).
‡ As proposed by 1984Ma30 and/or 1973Si32.
# From 1973Si32.

^{39}K(d,p) 1974Fi08

Jπ(^{39}K g.s.)=3/2+.
1974Fi08: E=12 MeV. Measured $\sigma(\theta)$, FWHM=15 keV, DWBA analysis. Cross sections are accurate to 15%.
Others:.
1959En57: E=6 MeV. Measured $\sigma(\theta)$, cross sections; deduced L values and reduced widths. A total of 52 groups identified which are in agreement with data from 1974Fi08.
1959Da02: E=8.9 MeV. Measured $\sigma(\theta)$ for 23 groups.
1957Te01: E=4 MeV. Measured $\sigma(\theta)$ for three groups at 0, 820 and 2080.
1953Bu98: E=4.8-5.7 MeV. Four groups reported at 0, 32, 800 and 893.
1950Sa03: E=3.90 MeV. Measured energies and relative yields of eight groups up to 4800.
Differential cross section data are also available from 1959En57

^{40}K Levels

Cross section data (1974Fi08)

Level	dσ/dΩ (max.) mb/sr	Level	dσ/dΩ (max.) mb/sr
0	3.0	3720	0.40
30	2.4	3773	0.50
801	1.8	3792	0.54
891	3.6	3827	0.53
1646	0.07	3870	3.8
1962	0.20	3928	0.26
2048	13	4025	2.6
2072	13	4080	0.15
2105	11	4109	4.2
2262	0.18	4211	0.15
2292	0.08 a	4263	8.3
2397	0.32	4298	0.60
2420	0.46	4356	0.13
2578	0.20	4401	3.6
2628	4.0	4467	4.2
2751	1.4	4546	4.0
2789	0.065	4592	2.2
2810	0.28	4663	1.2
2951	0.07	4765	0.90
2987	0.10	4794	1.6
3027	0.04	4811	2.8
3113	0.09	4878	0.36
3127	0.05	4912	2.5
3149	0.04	4948	0.70
3229	4.6	4997	0.10
3370	1.7	5030	0.10
3393	0.50	5081	0.38
3416	0.52	5116	0.46
3486	0.90	5136	1.1
3601	0.19	5158	0.44
3631	6.0	5210	0.80

a: 0.80 in Table 3 of 1974Fi08 seems a type error in view of the value shown in $\sigma(\theta)$ plot in figure 4.

E(level)	Jπ	L	(2J+1)s	Comments
0		3	8.1	
30 *5*		1+3	0.12,6.3	E(level): 32 *2* (1953Bu98).
801 *5*		1+3	0.07,4.6	
891 *5*		3	8.9	
1646 *5*		(2)	0.10	L: 1 (1959En57).
1962 *5*		0+2	0.012,.076	
2048 *5*		1	2.6	

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^{40}K Levels (continued)

E(level)	J^{π}	L	(2J+1)s	Comments
2072 *5*		1	2.6	
2105 *5*		1	2.2	
2262 *5*		(2)	0.26	
2292 *5*		(2,3)	0.13,0.18	E(level): probable doublet: 2290+2291. L: (1) (1959En57).
2397 *5*		1	0.064	
2420 *5*		1	0.092	
2578 *5*		2	0.26	
2628 *5*		1	0.76	
2751 *5*		1	0.25	
2789 *5*				
2810 *5*		1	0.048	
2951 *5*				
2987 *5*				
3027 *5*				L: 1 (1959En57) for an uncertain level at 3021.
3113 *5*		0[@]		
3127 *5*				
3149 *5*		(1)[@]		
3229 *5*		1	0.92	
3370 *5*		1	0.31	
3393 *5*		1	0.088	
3416 *5*		0+2	0.036,0.11	
3486 *5*		1	0.17	
3601 *5*		1	0.034	
3631 *5*		1	1.1	
3657 *8*[†]				
3720 *5*		1		
3738 *8*[‡]				
3773 *5*		(0,1)	0.08,0.072	L: 1 (1959En57).
3792 *5*		1	0.084	L: 0 (1959En57).
3827 *5*		1	0.080	
3838 *8*[‡]				
3870 *5*		1	0.61	
3883 *8*[†]				
3898 *8*[†]				
3928 *5*				
4025 *5*		1	0.40	
4080 *5*				
4109 *5*		1	0.656	
4211 *5*				
4263 *5*		1	1.3	
4298 *5*		1	0.12	
4356 *5*				
4401 *5*		1	0.58	
4467 *5*		1	0.68	
4546 *5*		1	0.63	
4592 *5*		1	0.30	
4663 *5*		1	0.16	
4765 *5*		0	0.056	
4794 *5*		1	0.20	
4811 *5*		1	0.35	
4878 *5*		1	0.044	
4912 *5*		1	0.35	
4948 *4*		1	0.084	
4997 *5*				
5030 *5*				
5080 *5*		1	0.046	
5116 *5*		1	0.056	

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^{40}K Levels (continued)

E(level)	Jπ	L	(2J+1)s	Comments
5136 *5*		1	0.12	
5158 *5*		1	0.054	
5210 *5*		1	0.10	
5340				E(level): from 1959Da02 only.

† From 1959En57, not resolved in 1974Fi08.
‡ Reported by 1959En57 only as a weak group.
# Isotropic distribution from $\sigma(\theta)$.
@ From 1959En57.

^{39}K(d,pγ) 1970Fr10,1973We01

1970Fr10: E=3.5, 3.7 MeV. Measured Eγ, pγ coin.
1973We01, 1970Se10: E=3.5 MeV. Measured lifetimes by DSAM.
2000El08: E=0.7-3.4 MeV. Measured thick target yields.

^{40}K Levels

E(level)†	Jπ@	$T_{1/2}$#
0	4-	
29.6	3-	
799.9 *8*	2-	0.40 ps *5*
891.6 *2*	5-	1.07 ps *17*
1644	0+	
1958.8 *9*	2+	0.42 ps *+28-14*
2047.1 *10*	2-	0.31 ps *5*
2069.9 *13*	3-	0.26 ps *+14-9*
2103.5 *9*	1-	0.36 ps *7*
2261‡	3+	49 fs *+55-28*
2290‡	1+	0.23 ps *+24-12*
2291‡	3-	0.21 ps *+12-8*
2397 *3*	4-	
2419‡	2-	0.28 ps *+28-10*
2575‡	2+	0.14 ps *+8-3*
2625.7 *10*	0-	0.22 ps *+14-8*
2731‡	1	<80 fs
2787‡	3+	<0.69 ps
2808 *2*		
3110 *3*		<97 fs
3228 *3*	2-	28 fs *21*
3370 *5*		
3629 *3*	2-,3-	<69 fs
3870 *5*	2-	

† From 1970Fr10, unless otherwise stated.
‡ From 1973We01.
# From DSAM (1973We01). The uncertainties are purely statistical; 15% systematic uncertainty estimated in the evaluation of 1978En02.
@ From Adopted Levels.

γ(^{40}K)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ†	Iγ‡
29.6	3-	0	4-	30	
799.9	2-	29.6	3-	770.32 *10*	100

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γ(^{40}K) (continued)

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ†	I_γ‡
		0	4-	800	<3
891.6	5-	799.9	2-	92	<4
		0	4-	891.60 *20*	100
1958.8	2+	799.9	2-	1158.95 *30*	
2047.1	2-	799.9	2-	1247.15 *30*	43 *4*
		29.6	3-	2017.3 *15*	29 *3*
		0	4-	2047.1 *10*	28 *3*
2069.9	3-	891.6	5-	1179	7 *2*
		799.9	2-	1270	7 *2*
		29.6	3-	2040.2 *10*	54 *5*
		0	4-	2070.2 *20*	32 *5*
2103.5	1-	1644	0+	460	<3
		799.9	2-	1303.6 *4*	27 *5*
		29.6	3-	2074.0 *10*	73 *5*
2261	3+	29.6	3-	2231	
		0	4-	2261	
2290	1+	1644	0+	646	
2291	3-	0	4-	2291	
2397	4-	29.6	3-	2367	
2419	2-	799.9	2-	1619	
		29.6	3-	2389	
2575	2+	29.6	3-	2545	
2625.7	0-	2103.5	1-	522.2 *4*	70 *5*
		799.9	2-	1826	30 *5*
2731	1	1644	0+	1087	
2787	3+	1958.8	2+	828	
2808		799.9	2-	2008 *2*	
3110		1958.8	2+	1151	50 *15*
		1644	0+	1466	50 *15*
3228	2-	799.9	2-	2428	20 *7*
		29.6	3-	3198	55 *10*
		0	4-	3228	25 *7*
3370		29.6	3-	3340	100
3629	2-,3-	2397	4-	1232	25 *7*
		2069.9	3-	1559	10 *5*
		29.6	3-	3599	20 *7*
		0	4-	3629	45 *10*
3870	2-	29.6	3-	3840	100

† From 1970Fr10 when Δ(Eγ) is quoted, otherwise level-energy differences.
‡ From 1970Fr10.

^{40}Ar(p,nγ) 1979Be41,1971We09,1970Tw01

1979Be41: E=5.75 MeV. Measured Eγ, Iγ, γ(θ), lifetimes by DSAM.
1971We09 (also 1970Ba34): E=3.7-4.9 MeV. Measured γ(θ).
1970Tw01 (also 1969Tw01): E=3.2-5.2 MeV. Measured Eγ, Iγ, γ(θ), γγ(θ), γ-ray polarization correlation.
Others:.
1977St29: E=8.30 MeV. Measured nγ, γγ, γγ(θ).
1973Da18: E=5.30-6.10 MeV. Measured γγ, γ(θ), γγ(θ). See most details from this study in (α,nγ).
1968Ma09: E=5 MeV. Measured lifetime of 1643 level.
1959Ly68, 1959Ho96: E=2.55, 2.878 MeV. Measured lifetime of 30-keV level (1959Ly68). Two γ′s reported at 29.4 and 771 (1959Ho96).

^{40}K Levels

E(level)†	Jπ@	$T_{1/2}$#	Comments
0	4-		
29.4	3-	3.88 ns *35*	$T_{1/2}$: γ(t) (1959Ly68).
800	2-	222 fs *21*	
891	5-	0.73 ps *14*	
1643	0+&	0.340 μs *7*	Jπ: 1977St29. $T_{1/2}$: γγ(t) (1968Ma09).
1959	2+&	0.513 ps *28*	
2047	2-	0.319 ps *21*	
2069	3-	0.73 ps *+24-15*	
2104	1-	0.58 ps *8*	
2261	3+&	69 fs *10*	
2290	1+&	94 fs *12*	
2291	3-	155 fs *17*	Jπ: from Adopted Levels. Others: 3-,4 (1979Be41), (3,4) (1971We09), 4(3) (1970Tw01,1969Tw01).
2397	4-	<38 fs	
2419	2-	0.73 ps *11*	
2543	7+		Jπ: adopted Levels. E(level): very weakly populated in (p,nγ) (1973Da18).
2576	2+	155 fs *11*	Jπ: from 1979Be41. Others: (2,4) (1973Da18), (2+,4+) in 1971We09.
2626	0-	215 fs *37*	
2731	1	<28 fs	
2747	(2,3)-	123 fs *25*	
2756	2+	<24 fs	Jπ: from Adopted Levels. Jπ=2,3- (1979Be41).
2785.6 *8*	(3,4)-	<28 fs	Jπ: from Adopted Levels. Jπ=3,4,5 (1979Be41).
2786.2 *5*	3+	<38 fs	Jπ: from Adopted Levels. Jπ=2-,3 (1979Be41).
2808	(1,2)-	0.16 ps *4*	
2879	6+		Populated weakly in (p,nγ) (1973Da18); also reported by 1977St29. Jπ: from adopted level. Other: Jπ=4,6 (1973Da18).
3147‡	1		
4384.0 *3*	0+		T=2 . E(level): from 1977St29.

† From 1979Be41, unless otherwise stated.
‡ From 1973Da18.
\# From DSAM (1979Be41), except as noted. The uncertainties are purely statistical; 15% systematic uncertainty is estimated in the evaluation of 1978En02.
@ Above 30-keV level, the assignments are from from γ(θ) data of 1979Be41, 1971We09 and 1970Tw01.
& Positive parity from γ-ray polarization correlation (1970Tw01, 1969Tw01).

γ(^{40}K)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.‡	δ‡	Comments
29.4	3-	0	4-	29.4 *10*	100			E_γ: from 1959Ho96.
800	2-	29.4	3-	770	100	D(+Q)	0.00 *1*	δ: from 1970Tw01. Other: 0.00 *3* (1971We09). A_2=-0.09 *1*, A_4=0.00 *1* (1970Tw01).

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γ(^{40}K) (continued)

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_{γ}†	I_{γ}‡	Mult.‡	δ‡	Comments
891	5-	0	4-	891	100	D+Q	+0.11 *5*	δ: A_2=-0.10 *1*, A_4=0.00 *1* (1971We09).
1643	0+	800	2-	843	16 *2*			
		29.4	3-	1613	84 *2*			
1959	2+	800	2-	1159	82 *2*	D(+Q)	0.00 *5*	δ: other: 0.00 *2* (1970Tw01), 0.00 *3* (1971We09). A_2=+0.33 *1*, A_4=+0.01 *1* (1979Be41). POL=-0.75 *20* (1970Tw01).
		29.4	3-	1929	18 *2*	D+Q	+0.11 *3*	δ: other: +0.10 *4* (1970Tw01), +0.10 *5* (1971We09). A_2=-0.21 *1*, A_4=-0.01 *1* (1979Be41).
2047	2-	800	2-	1247	40 *2*	D(+Q)	+0.05 *8*	δ: or +0.66 *41*. Others: +0.13 *9* (1970Tw01), +0.10 *+5-10* (1971We09). A_2=+0.47 *3*, A_4=+0.03 *2* (1979Be41).
		29.4	3-	2017	31 *2*	D(+Q)	0.00 *2*	δ: or +0.09 *4*, -5.7. Others: +0.01 *2* (1970Tw01), +0.05 *3* or -9.0 *20* (1971We09). A_2=-0.12 *2*, A_4=-0.04 *2* (1979Be41).
		0	4-	2047	29 *2*	Q		A_2=+0.16 *3*, A_4=0.00 *4* (1970Tw01).
2069	3-	891	5-	1178	3 *1*	Q		A_2=-0.18 *7*, A_4=0.00 *5* (1971We09). Note that sign of A_2 in 1971We09 seems in error since it is expected to be positive for a ΔJ=2, Q transition.
		800	2-	1269	6 *2*	D+Q	-0.20 *10*	δ: from 1970Tw01. Other:-0.05 *15* (1971We09). A_2=-0.69 *10*, A_4=+0.09 *12* (1970Tw01).
		29.4	3-	2039	50 *3*	D+Q	+0.27 *10*	δ: from 1970Tw01. Other: +0.25 *15* (1971We09). A_2=+0.61 *4*, A_4=-0.01 *5* (1970Tw01).
		0	4-	2069	41 *5*	D+Q	-0.07 *5*	δ: from 1970Tw01. Other: -0.07 *10* (1971We09). A_2=-0.03 *4*, A_4=+0.01 *5* (1970Tw01).
2104	1-	800	2-	1304	29 *4*	D(+Q)	+0.30 *6*	δ: from 1970Tw01. Others: +1.0 *5* (1971We09); +0.05, -0.53, -1, -4.3 (1979Be41). A_2=-0.12 *1*, A_4=0.00 *1* (1970Tw01).
		29.4	3-	2074	71 *4*	Q		A_2=+0.01 *2*, A_4=+0.01 *2* (1970Tw01).
2261	3+	29.4	3-	2231	83 *2*	D(+Q)	+0.01 *9*	δ: others: +0.02 *5* (1970Tw01), 0.00 *10* (1971We09). A_2=+0.44 *3*, A_4=-0.03 *2* (1979Be41). POL=-0.57 *30* (1970Tw01).

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[‡]	δ[‡]	Comments
		0	4-	2261	17 *2*	D(+Q)	-0.05 *6*	δ: others: -0.04 *6* (1970Tw01), 0.00 *5* (1971We09). A_2=-0.05 *3*, A_4=-0.04 *3* (1979Be41).
2290	1+	1959	2+	331	4 *2*			
		1643	0+	647	60 *2*	D		A_2=-0.10 *1*, A_4=+0.05 *2* (1979Be41).
		800	2-	1490	36 *3*	D+Q	+0.14	δ: others: >+0.3 (1970Tw01), +0.15 *15* or <-3.0 (1971We09), -0.02 *5* (1973Da18). A_2=-0.05 *2*, A_4=-0.01 *2* (1979Be41).
2291	3-	891	5-	1400	16 *2*			A_2=+0.13 *11*, A_4=-0.11 *12* (1973Da18).
		0	4-	2291	84 *2*	D+Q	-0.8 *+3-5*	δ: for J=3. Others: -1.0 *3* (1970Tw01,1971We09), -0.6 *+1-8* (1973Da18). For J=4, δ=+0.02 *+30-12* or +0.67 *3* (1979Be41); +0.35 *25* (1970Tw01); 0.00 *10* (1971We09); -0.02 *+9-5* (1973Da18). A_2=+0.50 *3*, A_4=-0.07 *4* (1979Be41).
2397	4-	29.4	3-	2367	71 *2*	D+Q	+0.25 *4*	δ: other: +0.27 *6* (1973Da18). A_2=+0.21 *3*, A_4=-0.07 *3* (1979Be41).
		0	4-	2397	29 *2*	D+Q	-0.32 *12*	δ: +2.4 *5* (1973Da18). A_2=+0.19 *5*, A_4=-0.08 *6* (1979Be41).
2419	2-	800	2-	1619	79 *2*	D+Q		δ: -0.03 *13* or +2.2 *7*. Others: +0.07 *5* or +1.8 *2* (1973Da18), +0.05 *10* or +2.0 *6* (1970Tw01). A_2=+0.32 *3*, A_4=-0.01 *2* (1979Be41).
		29.4	3-	2389	15 *2*	D+Q		δ: -0.25 or -2.6. Other: -0.8 *5* (1973Da18). A_2=+0.22 *3*, A_4=+0.03 *3* (1979Be41).
		0	4-	2419	6 *1*	Q(+O)	+0.17 *28*	δ: other: 0.00 *+15-30* (1973Da18). A_2=+0.06 *6*, A_4=-0.13 *7* (1979Be41).
2543	7+	891	5-	1652[a]	88 *2*[a]			δ: +1.0 *+2-4* for J=5 (1973Da18). A_2=+0.41 *6*, A_4=-0.17 *7* (1973Da18).
		0	4-	2542[a]	12 *2*[a]			
2576	2+	29.4	3-	2546	100	D(+Q)		δ: +0.03 *+7-4* or -7.6 *+13-20*. Others: +0.08 *3* (1970Tw01); 0.00 *3* (1973Da18). For J=4, δ=+0.06 *2* (1970Tw01); +0.09 *4* (1973Da18). A_2=-0.13 *1*, A_4=-0.01 *1* (1979Be41).
2626	0-	2104	1-	522	69 *2*	D		A_2=-0.01 *4*, A_4=+0.03 *4* (1979Be41).

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[‡]	δ[‡]	Comments
		800	2-	1826	31 *2*	Q		A_2=-0.09 *14*, A_4=+0.21 *16* (1979Be41).
2731	1	1959	2+	772[b]				
		1643	0+	1088	94 *4*	D		I_γ: other: 73 *9* (1977St29). See comment for 772γ. A_2=-0.13 *4*, A_4=-0.03 *5* (1979Be41).
		800	2-	1931	6 *4*			I_γ: other: 4 *3* (1977St29).
2747	(2,3)-	2069	3-	678	<3			
		1959	2+	788	4 *1*			
		29.4	3-	2717	63 *3*	D+Q		δ: 0.0 *1* for J=2, -0.19 *14* or -3.4+13-29 for J=3. Other: -1.2 *+8-5* for J=2, -0.09 *+18-9* for J=3, +0.36 *7* for J=4 (1973Da18). A_2=+0.30 *3*, A_4=-0.01 *4* (1979Be41).
		0	4-	2747	33 *3*	D+Q		δ: -0.87 *+5-16* for J=2, -0.18+11-18 for J=3. Other: -0.09 *+12-8* for J=2, -0.27 *8* or -2.8 *+5-8* for J=3, -0.27 *+15-9* for J=4 (1973Da18). A_2=+0.12 *5*, A_4=+0.02 *5* (1979Be41).
2756	2+	800	2-	1956	66 *2*	D+Q		δ: +0.19 *+19-26* or -2.1 *+13-7* (1979Be41). Other: -0.02 *7* or -1.7 *+5-3* for J=2 (1973Da18). For J=3, δ=+0.45 *11* (1979Be41), +0.36 *5* (1973Da18). A_2=+0.38 *4*, A_4=+0.01 *4* (1979Be41).
		29.4	3-	2726	34 *2*	D+Q		δ: 0.00 *12* or -4.7 *+20-144* (1979Be41). Other: 0.00 *3* (1973Da18). For J=3, δ=-0.47 *+9-23* or +5.1 *+63-24* (1979Be41); -0.52 *+8-12* (1973Da18). A_2=-0.02 *3*, A_4=-0.11 *4* (1979Be41).
2785.6	(3,4)-	2291	3-	496	40 *8*			
		891	5-	1896	19 *8*			
		0	4-	2786	41 *8*	D+Q		δ: >+0.09 or <+19 for J=3, <-0.81 or >+4.9 for J=4, -0.19+19-34 or -1.8 *4* for J=5. A_2=-0.58 *13*, A_4=-0.11 *4* (1979Be41).
2786.2	3+	1959	2+	828	22 *3*	D+Q	-0.09 *7*	δ: from A_2=-0.44 *9*, A_4=-0.11 *9* (1973Da18).
		29.4	3-	2756	78 *3*	D+Q		δ: +0.03 *14* or +1.1 *4* (1979Be41). Other: +0.09 *11* (1973Da18). For J=2, δ=-0.81 *34* (1979Be41). A_2=+0.43 *2*, A_4=-0.06 *2* (1979Be41).
2808	(1,2)-	800	2-	2008[a]	100[a]			δ: -0.09 to -2.14 for J=1; -0.27 *5* or +5.7 *+24-14* for J=2 (1973Da18).

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ[†]	I_γ[‡]	Mult.[‡]	δ[‡]	Comments
								A_2=+0.07 *2*, A_4=+0.02 *2* (1973Da18).
2879	6+	2543	7+	336[a]	62 *4*[a]			δ<0.10 (1973Da18).
		891	5-	1987[a]	38 *4*[a]	D(+Q)	-0.09 *9*	δ: A_2=-0.05 *14*, A_4=-0.06 *15* (1973Da18).
3147	1	1643	0+	1503[a]	33 *5*[a]	D		Mult.: A_2=-0.37 *9*, A_4=-0.19 *10* (1973Da18).
		800	2-	2347[a]	67 *5*[a]	D+Q	+0.1 *2*	δ: A_2=-0.04 *3*, A_4=-0.08 *3* (1973Da18).
4384.0	0+	2731	1	1653	24 *3*[c]			(1653γ)(1087γ)(θ): A_2=+0.42 *19* (1977St29).
		2290	1+	2094	76 *3*[c]			(2094γ)(646γ)(θ): A_2=+0.42 *10* (1977St29).

[†] From level energy differences.
[‡] From 1979Be41, unless otherwise stated.
[a] From 1973Da18. The energies are rounded off. The precise Eγ′s and branching ratios given by 1973Da18 are most likely from their (α,nγ) experiment.
[b] γ reported only by 1977St29 with Iγ=23 *8*. With this large intensity, this γ should have been seen in the high-resolution (n,γ) experiment where only one γ ray at 770.3053 is reported. Thus this γ ray is considered as suspect by the evaluators.
[c] From 1977St29.

^{40}Ar(^{3}He,t) **1968We09**

1968We09: E=17.9 MeV. Measured $\sigma(\theta)$, FWHM=150 keV, DWBA analysis.
Others:.
1972FaZT: E=35 MeV; measured $\sigma(\theta)$ for.
1650 and 4380 levels.
1970Hi06: E=35 MeV. Measured $\sigma(\theta)$ for 0+ analog and antianalog states.
1970No05: analyzed shapes of $\sigma(\theta)$ distributions.

^{40}K Levels

E(level)	J$^{\pi}$†	L	dσ/dΩ (max) mb/sr‡	Comments
0[c]	4-&3-	3+5	0.025[&]	
840 *20*[d]	2-&5-	3+5	0.010[a]	
1650 *20*	0+		0.057[@]	Antianalog state (1970Hi06).
1960 *20*	2+	2+4	0.063[#]	
2290 *20*			0.08[#]	
2770 *20*			0.15[#]	
3080 *20*			0.09[#]	
3440 *20*			0.08[b]	
3730 *20*			0.09[#]	
4380 *20*	0+	0	0.60[@]	E(level): analog state.
5870 *20*				

† From Adopted Levels.
‡ Read off the differential cross section plots.
# At 20°.
@ At 0°.
& At 25°.
[a] At 30°.
[b] At 23°.
[c] Doublet: 0+28.
[d] Doublet: 800+891.
[e] $\sigma(\theta)$ and DWBA comparisons fit L=1 (1968We09,1970Hi06), rather than L=0 shape. The shapes of the $\sigma(\theta)$ distributions for the 1650 (antianalog state) and 4380 (analog state) are in antiphase (1970Hi06,1972FaZT). 1970Hi06 suggested that modifications were needed in the conventional description of the (^{3}He,t) reaction, but 1970No05 pointed out that the observed $\sigma(\theta)$ shape for antianalog states can be understood on the basis of structural relation between analog and antianalog states together with the assumption of a pure charge-exchange mechanism.

^{40}K(γ,γ):Mossbauer 2000Se01,1965Ru02,1965Ha14

2000Se01, 2002Se12: level populated by synchrotron radiation, measured Eγ, $T_{1/2}$.
1965Ru02: measured scattering at 90°.
1965Ha14: measured absorption; deduced isomer shift, linewidth.
Other: 1968Ts01.

^{40}K Levels

E(level)	Jπ†	$T_{1/2}$	Comments
0	4-		
29.834 *11*	3-	4.13 ns *12*	$T_{1/2}$: from 2000Se01 and 2002Se12. Other: 4.3 ns *9* (1965Ha14).

† From Adopted Levels.

γ(^{40}K)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ	Comments
29.834	3-	0	4-	29.834 *11*	Eγ: from 2000Se01 and 2002Se12.

^{40}Ca(n,pγ),(n,p) 1972Di10,1967An07

1972Di10: (p,nγ) E=4.85-8.05 MeV. Natural target. Measured Eγ, Iγ, cross sections at 4.85, 5.40, 5.90, 6.45, 7.00, 7.50 and 8.05 MeV.
1967An07: (n,p) E=14.4 MeV. Measured E(p), σ(θ), FWHM=600 keV.
Others:.
1992Pa06: (n,p) E=60-260 MeV. Measured σ(θ), deduced distributions of Gamow-Teller (>) (ΔL=0,ΔS=1,ΔJ=1) strength, Giant-dipole resonance (GDR,ΔS=0), and Giant-spin dipole resonance (GDSR,ΔS=1).
1980Ba50: (n,p) E=2.7-5.5 MeV. Measured σ.
1974Ba16: (n,p) E=2.41-2.86 MeV. Measured σ.
1972Fo21, 1961Ur03: (n,p) E=5.85 MeV. Measured σ(θ) for 0+30 doublet.
1969Wi12: (n,p) E=14.6 MeV. Measured σ(θ).
1968Ka05: (n,p) E=14.1 MeV. Measured σ(θ).
1967Me11: (n,p) E=152 MeV. Measured proton spectrum.
1956Da23: (n,pγ) E=2.557 MeV. Three γ's reported at 30, 767 and 877 from first three excited states.

^{40}K Levels

E(level)‡	Jπ†	Comments
0	4-	
30	3-	Total cross section for g.s.+30=365 mb *27* at E(n)=5.85 MeV (1972Fo21).
800	2-	Jπ: σ(θ) in 1992Pa06.
891	5-	
1644	0+	
1959	2+	
2048	2-	
2070	3-	
2103	1-	
2261	3+	
2290	1+	
2291	3-	
2397	4-	
2419	2-	
2558#		
2577	2+	
2626	0-	
2757	2+	
2808		

† From Adopted Levels.
‡ g.s.+30, and 800+891 are unresolved in (n,p) (1967An07).
# Level not reported in any other study of ^{40}K, it is considered as suspect by the evaluators.

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	$\gamma(^{40}K)$ $d\sigma/d\Omega$ (mb/sr).‡	Comments
Unplaced				828 *2*	0.32 *11*	
				870 *2*	0.37 *12*	
				979 *2*	0.35 *12*	
				1332 *2*	0.25 *10*	
				1434 *2*	0.58 *14*	
				1453 *2*	0.40 *12*	
				1694 *2*	0.40 *12*	
				1881 *2*	0.43 *13*	
				2939 *2*	0.34 *13*	
				3475 *2*	0.33 *13*	
30	3-	0	4-	30 *2*		E_γ: from 1956Da23.
800	2-	30	3-	770	17.0 *17*	
891	5-	0	4-	891	3.6 *4*	
1959	2+	800	2-	1159	6.1 *6*[a]	
		30	3-	1929	0.87 *9*	
2048	2-	800	2-	1248	1.07 *13*	
		30	3-	2018	0.79 *12*	
		0	4-	2048	0.86 *12*	
2070	3-	800	2-	1270	0.52 *12*	
		30	3-	2040	2.07 *23*	
		0	4-	2070[e]	≈1.45	
2103	1-	30	3-	2073[e]	≈0.73	
2261	3+	30	3-	2231	0.65 *22*	
2290	1+	1644	0+	646	0.75 *10*	
2291	3-	0	4-	2291	0.70 *13*[b]	
2397	4-	30	3-	2367[d]	0.80 *16*	
2419	2-	800	2-	1619	1.15 *20*	
2558		0	4-	2558	0.21 *9*	
2577	2+	30	3-	2547	1.56 *19*	
2626	0-	2103	1-	522	0.38 *15*[c]	
2757	2+	800	2-	1957	0.40 *13*	
2808		800	2-	2008[d]	1.03 *12*	
		0	4-	2808[d]	0.73 *14*	

‡ From 1972Di10, at E(n)=7.50 MeV, unless otherwise stated. 1972Di10 give cross section data at E(n)=4.85, 5.45, 5.90, 6.45, 7.00 and 8.05 MeV also.
[a] May contain some contribution from ^{44}Ca.
[b] At E(n)=5.90 MeV.
[c] At E(n)=7.00 MeV.
[d] Wide peak at all neutron energies, may have another component.
[e] 2070 and 2073 are unresolved.

^{40}Ca(pol d,2p),(d,2p) 1990MaZN

1990MaZN: (pol d,2p) E=56 MeV: measured $\sigma(\theta)$, analyzing powers, FWHM=400 keV.
1988BaZW: (pol d,2p) E=650 MeV; measured tensor analyzing power.
1980StZO: (d,2p): E=60 MeV. Measured $\sigma(\theta)$.

^{40}K Levels

E(level)	J^π
0	
800	
2300	

^{40}Ca(t,^{3}He) 1985Aj03

1985Aj03: E=25 MeV. Measured $\sigma(\theta)$, comparison with coupled- channel calculations.
Other:.
1991Pi09: E=33 MeV. Measured $\sigma(\theta)$, FWHM=100 keV, fits to cross sections included finite range and multi-step DWBA. First four states studied.

^{40}K Levels

E(level)	Jπ#	L	Comments
0	4-	3+5	
31 *5*	3-	3	
800 *5*	2-	1+3	
891 *5*	5-	5	
1642 *8*			
1959 *8*	2+	2	
2055 *15*‡			E(level): corresponds to 2047+2070.
2091 *20*	1-	1	
2265 *15*†			
2288 *20*‡	1+	0+2&	E(level): corresponds to 2290+2291.
2390 *10*		1+3@&	
2411 *15*	2-	1+3@&	
2534 *15*†			
2566 *15*			
2606 *15*			
2724 *15*	1(-)	1	
2774 *20*			
2807 *20*			
2865 *20*	6+		
2938 *20*			
3017 *15*‡			
3100 *15*			
3120 *15*			
3216 *15*	2-	1+3	
3272 *15*		(0+2)	
3360 *15*			
3391 *20*			
3465 *15*‡	2-		E(level): corresponds to 3439+3486.
3517 *15*†			
3618 *15*‡		1+3&	Jπ: 2-&3- possible. E(level): corresponds to 3599+3630.
3653 *20*			
3715 *15*‡			
3780 *30*‡			
3859 *15*‡		1&	E(level): corresponds to 3840+3869.
3883 *15*			
3995 *15*‡			
4091 *15*‡			E(level): corresponds to 4076+4105.
4190 *20*†			
4237 *15*	1-	1	
4277 *15*	2-	1+3	
4335 *15*			
4374 *15*			
4455 *15*			
4508 *15*			
4535 *15*†			
4781 *15*			$\sigma(\theta)$ is not forward peaked.

† Weak group, observed at several angles.
‡ Unresolved states.
# From Adopted Levels.
@ For 2390+2411.

& $\sigma(\theta)$ is of unresolved group.

^{40}Ca(^{7}Li,^{7}Be)

1979Wi01: E=35 MeV. Measured $\sigma(\theta)$.
1996Wi05: E=490 MeV.
1986NaZW: E=150 MeV.

^{40}K Levels

E(level)	Jπ	Comments
15†		E(level): 0+30.
850†		E(level): 800+891.
1960†		
2270†		E(level): 2260+2290.
7000‡		
11000‡		E(level): T=2 analog of GDR in ^{40}Ca.

† From 1979Wi01.
‡ From 1996Wi05.

^{40}Ca(^{12}C,^{12}N),(^{13}C,^{13}N) 1988Vo06,1993Be19

1988Vo06: (^{12}C,^{12}N) E=70 MeV/nucleon. Measured $\sigma(\theta)$, FWHM≈300 keV. Deduced spin-flip giant resonance.
1993Be19 (also 1989Be50): (^{13}C,^{13}N) E=50 MeV/nucleon. Measured energy of the GDR, IAS.

^{40}K Levels

E(level)	Jπ#	$T_{1/2}$‡	Comments
0†	4-		
30†	3-		
740†	2-		
890†	5-		
11×10^3 *4*			E(level): wide bump (1988Vo06) interpreted as spinflip giant-dipole resonance split into several states of Jπ=0-,1-, and 2-.
12.0×10^3 *3*		3.1 MeV *2*	E(level): from 1993Be19. Corresponding energy of GDR in ^{40}Ca=19.7 MeV *3*.

† g.s.+30 and 740+890 are unresolved structures.
‡ Γ.
# From Adopted Levels.

^{41}K(n,2n),(n,2nγ) 1972Ad01

1972Ad01: (n,2nγ) E=14.7 MeV. Measured nγ(t).
1979Ha60: (n,2n), (n,2nγ) E=14.9 MeV. Measured cross section and nγ(t).

^{40}K Levels

E(level)	Jπ	$T_{1/2}$	Comments
0†			
30†			
850			E(level): doublet 800+890.
1640		294 ns *23*	$T_{1/2}$: from 1972Ad01. Other: 0.26 μs *15* (1979Ha60)

† Unresolved doublet.

$\gamma(^{40}K)$

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ
1640		30		1610

^{41}K(p,d) 1973Wi16

Jπ(^{41}K g.s.)=3/2+.
1973Wi16 (also thesis by 1973WiYW): E=15 MeV. Measured σ(θ), FWHM=15-30 keV, DWBA analysis.

^{40}K Levels

E(level)†	Jπ†	L	C^2S‡	Comments
0#	4-	3	0.51 *12*	
30#	3-	3	0.53 *11*	
800	2-	3+1	0.074 *10*	S: for L=3; 0.012 *3* for L=1.
891	5-	3	0.28 *5*	

† From Adopted Levels.
‡ $f_{7/2}$ orbital assumed for L=3 and $p_{3/2}$ orbital for L=1.
# Unresolved structure.

^{41}K(d,t) 1973Wi16

Jπ(^{41}K g.s.)=3/2+.
1973Wi16 (also thesis by 1973WiYW): E=15 MeV. Measured σ(θ), FWHM=15-30 keV, DWBA analysis.

^{40}K Levels

E(level)†	Jπ‡	L	C^2S#	Comments
0	4-	3	0.61 *9*	
30	3-	3	0.60 *9*	
800	2-	3+1	0.074 *10*	S: for L=3, 0.0053 *10* for L=1.
891	5-	3	0.34 *5*	
1644	0+	2	0.06 *2*	
1959	2+	2+0	0.07 *2*	S: for L=2, 0.015 *5* for L=0.
≈2000				E(level): multiplet.
2260	3+	2	0.86 *3*	
2290	1+	2(+0)	0.09 *2*	S: for L=2, 0.11 *20* for L=0.
2385 *10*		2	0.16 *6*	
2566 *10*		2	0.07 *2*	

† From Adopted Levels where uncertainty is not stated.
‡ From Adopted Levels.
# The following orbitals are assumed for different L transfers: $s_{1/2}$ for L=0, $p_{3/2}$ for L=1, $d_{3/2}$ for L=2, $f_{7/2}$ for L=3.

^{41}Ca(d,^{3}He) 1979Ro05

Jπ(^{41}Ca g.s.)=7/2-.
1979Ro05: E=20 MeV. Measured σ(θ), FWHM=15-20 keV, DWBA analysis.
1975Be45: E=40 MeV. Measured σ(θ), FWHM=15-20 keV, DWBA analysis.

^{40}K Levels

E(level)	Jπ†	L	C^2S‡
0	4-	2	1.03 *12*
30	3-	2	0.86 *6*
800	2-	2	0.57 *7*
892	5-	2	1.46 *17*
2070	3-	0	0.30 *2*
2398	4-	0	0.73 *8*
2800	(3,4)-	0	0.61 *23*

† From Adopted Levels.
‡ Relative values. The absolute spectroscopic factors are 19% lower with an uncertainty of 20% (1979Ro05).

^{42}Ca(p,^{3}He) 1970Ha10,1970Ko13

1970Ha10: E=45 MeV. Measured σ(θ), deduced T=2 isobaric analog states.
1970Ko13: E=40 MeV. Measured σ(θ), deduced L-transfers.
1972DeYF: E=41.7 MeV. Measured σ(θ).

^{40}K Levels

E(level)	Jπ	L	Comments
0	4-		Jπ: from Adopted Levels.
1640	0+	0	Jπ: 0+ is confirmed by characteristic L=0 shape and is consistent with its non-population in (α,d). This state is interpreted as an antianalog state.
2290			Doublet: 2290+2291.
4375 *25*	0+	0	E(level): from 1970Ha10, interpreted as T=2 analog state. Jπ: from L=0 transfer.

^{42}Ca(pol d,α),(d,α) 1981Sh12

1981Sh12: (pol d,α), (d,α) E=7-10 MeV. Measured $\sigma(\theta)$, tensor analyzing power at 4°, FWHM=15-20 keV.
Other:.
1971Pa16: (d,α) E=11.0 MeV. Measured $\sigma(\theta)$, FWHM=30=40 keV. About ten groups reported up to about 4 MeV excitation energy.

^{40}K Levels

1644, 0+ level was not populated in this reaction which is consistent with its interpretation by 1981Sh12 as an antianalog state of 4380, 0+ level in ^{40}Ar.

E(level)	J$^{\pi}$‡	Comments
0	UNNATURAL	<T$_{20}$> =-0.57 *25*.
29 *5*	NATURAL	<T$_{20}$> =+0.67 *28*.
800 *5*	UNNATURAL	<T$_{20}$> =-0.47 *22*.
888 *5*		
1959 *5*	NATURAL	<T$_{20}$> =+0.71 *18*.
2049 *5*	UNNATURAL	<T$_{20}$> =-0.29 *21*.
2262 *5*	UNNATURAL	<T$_{20}$> =-1.01 *17*.
2289 *5*†		E(level): possibly 2290+2291.
2400 *5*	UNNATURAL	<T$_{20}$> =-0.87 *12*.
2413 *5*	UNNATURAL	<T$_{20}$> =-1.14 *18*.
2545 *5*	UNNATURAL	<T$_{20}$> =-0.45 *14*.
2574 *5*		
2634 *5*	0-	Jπ: from Adopted Levels. <T$_{20}$> =-1.50 *24*.
2747 *5*†		E(level): possibly 2748+2756.
2798 *5*†		E(level): possibly 2786+2787.
2811 *5*		
2990 *5*	UNNATURAL	<T$_{20}$> =-0.01 *23*.
3033 *5*	UNNATURAL	<T$_{20}$> =-0.04 *18*.
3096 *10*†		E(level): possibly 3100+3110.
3125 *10*		
3156 *10*†		E(level): possibly 3146+3154.
3236 *10*	UNNATURAL	<T$_{20}$> =+0.29 *30*.
3293 *10*	UNNATURAL	<T$_{20}$> =-0.19 *27*.
3369 *10*		
3389 *10*	UNNATURAL	<T$_{20}$> =+0.17 *22*.
3415 *10*		
3448 *10*	UNNATURAL	<T$_{20}$> =-0.45 *18*.
3491 *10*	UNNATURAL	<T$_{20}$> =+0.25 *13*.
3568 *10*	(NATURAL)	<T$_{20}$> =+0.64 *27*.
3618 *10*†	UNNATURAL	<T$_{20}$> =-0.47 *23*. E(level): possibly 3599+3630.
3682 *10*		
3710 *10*	(UNNATURAL)	<T$_{20}$> =-0.10 *28*.
3737 *10*	UNNATURAL	<T$_{20}$> =-0.2 *6*.
3770 *10*	(UNNATURAL)	<T$_{20}$> =+0.1 *7*.
3797 *10*	UNNATURAL	<T$_{20}$> =-0.54 *25*.
3821 *10*	UNNATURAL	<T$_{20}$> =0.00 *20*.
3869 *10*	(NATURAL)	<T$_{20}$> =+0.9 *3*.
3892 *10*†		E(level): possibly 3888+3902. <T$_{20}$> =+0.6 *5*.
3921 *10*	(UNNATURAL)	<T$_{20}$> =+0.47 *28*.
3996 *10*	UNNATURAL	<T$_{20}$> =-0.1 *3*.
4033 *10*	(UNNATURAL)	<T$_{20}$> =-1.2 *3*.
4071 *10*		<T$_{20}$> =-0.79 *19*.
4118 *10*	UNNATURAL	<T$_{20}$> =+0.07 *15*.
4154 *10*	(UNNATURAL)	<T$_{20}$> =-0.05 *10*.
4181 *10*		

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^{40}K Levels (continued)

E(level)	Jπ‡	Comments
4217 *10*	UNNATURAL	$\langle T_{20}\rangle$ =+0.4 *4*.
4255 *10*	(UNNATURAL)	$\langle T_{20}\rangle$ =-0.30 *25*.
4310 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.60 *19*.
4362 *10*†	UNNATURAL	$\langle T_{20}\rangle$ =-0.21 *26*. E(level): possibly 4352+4366.
4398 *10*†	(UNNATURAL)	$\langle T_{20}\rangle$ =-0.22 *19*. E(level): possibly 4384+4396.
4470 *10*	NOT 0-	$\langle T_{20}\rangle$ =+0.42 *16*.
4535 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.04 *75*.
4590 *10*	UNNATURAL	$\langle T_{20}\rangle$ =+0.11 *14*.
4663 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.22 *11*.
4697 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.5 *3*.
4749 *10*		
4762 *10*	(UNNATURAL)	$\langle T_{20}\rangle$ =-0.03 *21*.
4786 *10*	(UNNATURAL)	$\langle T_{20}\rangle$ =-0.38 *26*.
4827 *10*	UNNATURAL	$\langle T_{20}\rangle$ =+0.30 *10*.
4848 *10*		
4873 *10*†		E(level): possibly 4874+4876.
4930 *10*	UNNATURAL	$\langle T_{20}\rangle$ =+0.38 *9*.
4942 *10*	(UNNATURAL)	$\langle T_{20}\rangle$ =-0.15 *28*.
4995 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.7 *4*.
5030 *10*		
5068 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.66 *16*.
5111 *10*†	UNNATURAL	$\langle T_{20}\rangle$ =-0.21 *9*. E(level): possibly 5112+5132.
5169 *10*		
5212 *10*	UNNATURAL	$\langle T_{20}\rangle$ =-0.36 *13*.

† Unresolved multiplet.

‡ From average tensor analyzing powers ($\langle T_{20}\rangle$) at 4°, averaged over 4 or 5 (in some cases 3) energies. Except for 2633 and 4033 levels, Jπ=0- is not allowed by the measured $\langle T_{20}\rangle$. In most cases of unnatural parity, Jπ=2- when combined with restrictions from other experiments.

(HI,xnγ) 1977Eg01,1981He20

1977Eg01: ^{26}Mg(^{16}O,npγ) E=34 MeV. Measured Eγ, Iγ, γγ, γ(θ), γ(lin pol).
1981He20: ^{27}Al(^{19}F,αpnγ) E=70 MeV. Measured Eγ, Iγ, γγ, γ(θ).
Others:.
1991Ja11: ^{27}Al(^{16}O,n2pγ) E=60 MeV. Measured lifetime of 892, 2543 and 4366 levels by recoil-distance method (RDM).
1990Ki04: ^{27}Al(^{13}C,γ) E=39.7 MeV. Measured continuum γ, γ(θ); deduced GDR parameters and strength function.
1981Le19: ^{24}Mg(^{18}O,npγ) E=36 MeV. Measured γ(θ,H) by recoil into gas, deduced g factor of 2543 level.
1976Bo21, 1975Bo44: ^{27}Al(^{16}O,n2pγ) E=30-35 MeV; ^{28}Si(^{14}N,2pγ) E=38 MeV; ^{24}Mg(^{19}F,n2pγ) E=42 MeV. Measured γ(θ,H), deduced g factor of 2543 level and hyperfine perturbations.
1976Ra05: ^{27}Al(^{16}O,n2pγ) E=32.5 MeV. Measured γ(θ,t) for recoil in vacuum, deduced lifetime of 2543 level and hyperfine deorientation.
1976Ke02: ^{27}Al(^{16}O,n2pγ) E=32.5-44 MeV. Measured γ, lifetimes by recoil-distance method.

^{40}K Levels

E(level)	J^{π}†	$T_{1/2}$‡	Comments
0.0	4-@		
30	3-@		
891.45 *15*	5-	2.3 ps *10*	
2542.77 *17*	7+	1.10 ns *7*	$T_{1/2}$: others: 1.10 ns *8* (1976Ke02); 1.10 ns *8*, 1.06 ns *7* (apparent half-lives at 55° and 0°, respectively,1976Ra05). g=0.63 *15* (1981Le19), +0.59 *10* (1976Bo21), +0.49 *10* (1975Bo44).
2879.01 *22*	6+		
4365.6 *4*	(8+)	0.36 ps *14*	$T_{1/2}$: the uncertainty may be larger since lifetime of the 4366 level is comparable to the stopping time in the tantalum stopper. Other: <0.7 ps (1977Eg01).
4875.6 *4*	9+	<0.7 ps#	
6227.0 *5*	(8,10)-	<1.4 ps#	
7472.4 *5*	(9-,11-)		E(level): level from 1981He20 only.

† From γ(θ) and γ(lin pol) data.
‡ From RDM (1991Ja11), unless otherwise stated.
# From DSA (1977Eg01).
@ From Adopted Levels.

γ(^{40}K)

A_2, A_4 and POL are from 1977Eg01, unless otherwise stated.

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ†	I_γ†	Mult.	δ†	Comments
Unplaced				810.3 *3*				
				916.5 *6*				
				939.9 *5*				
				1329.1 *14*				
				1526.9 *4*				
				2267.9 *8*				
				2790.4 *9*				
891.45	5-	30	3-	861	<1			
		0.0	4-	891.46 *16*	100 *3*	M1+E2	+0.099 *8*	δ: other: +0.070 *10* (1981He20). A_2=-0.091 *9*, A_4=0, POL=-0.43 *3*.
2542.77	7+	891.45	5-	1651.29 *12*	78.0 *18*	M2(+E3)	-0.01 *3*	δ: other: -0.3 *2* (1981He20). A_2=+0.301 *13*, A_4=-0.105 *15*, POL=-0.52 *5*.
		0.0	4-	2542.6 *3*	9.8 *5*	E3(+M4)	+0.10 *7*	δ: from 1981He20. Data of 1977Eg01 consistent with pure E3. A_2=+0.46 *3*, A_4=0, POL=+0.83 *19*.

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γ(^{40}K) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ†	Mult.	δ†	Comments
								A_2=+0.50 *4*, A_4=+0.06 *4* (1981He20).
2879.01	6+	2542.77	7+	336.18 *16*	10.5 *3*	D(+Q)	+0.01 *2*	δ: other: -0.015 *20* (1981He20). A_2=-0.19 *3*, A_4=0, POL=-0.22 *3*.
		891.45	5-	1987.8 *6*	5.4 *7*	D(+Q)	-0.05 *4*	A_2=-0.34 *5*, A_4=0, POL=+0.4 *3*.
4365.6	(8+)	2879.01	6+	1486.3 *5*	3.5 *11*			A_2=+0.9 *5*, A_4=-0.5 *4*.
		2542.77	7+	1822.9 *3*	19 *4*			
4875.6	9+	4365.6	(8+)	509.4 *10*	10 *3*			
		2542.77	7+	2332.8 *4*	18.0 *20*	E2		A_2=+0.35 *5*, A_4=-0.19 *5*, POL=+0.51 *7*.
6227.0	(8,10)-	4875.6	9+	1351.37 *18*	12.0 *10*	E1(+M2)	-0.07 *5*	δ: from 1981He20. A_2=-0.19 *3*, A_4=0, POL=+0.29 *5*.
		4365.6	(8+)	1861	<0.6			
		2542.77	7+	3684	<0.25			
7472.4	(9-,11-)	6227.0	(8,10)-	1245.42 *22*		D+Q	+0.13 *7*	E_γ: from 1981He20. γ not reported by 1977Eg01. A_2=-0.08 *5*, A_4=0 (1981He20).

† From 1977Eg01, unless stated otherwise.

Adopted Levels, Gammas

Q(β^-)=-14323.0 *28*; S(n)=15643.2 *19*; S(p)=8328.23 *9*; Q(α)=-7039.65 *21* 2003Au03
Additional details of data for resonances in different reactions can be found in the following datasets:.
^{36}Ar(α,γ):resonances: 24 resonances from Eα(lab)=5486 to 13330 (excitation energy in ^{40}Ca=11978-19038).
^{39}K(p,γ): excitation energies and γ-decays for about 160 resonances.
^{39}K(p,p),(p,α):resonances: 267 resonances from E(p)(lab)=1102-6660 (excitation energy in ^{40}Ca=9403-14680).
^{40}Ca(p,pα),(p,2p):resonances: two resonances with excitation energies (in ^{40}Ca) at 11700 and 12300.
Other reactions (giant resonances, properties of compound nucleus, reaction mechanism, etc.):.
^{12}C(^{28}Si,X) or ^{28}Si(^{12}C,X): 2002Ro35, 1995Na09, 1986Ha33, 1983Ra26, 1979Os01, 1979Cl02, 1979Ba49, 1973Ho37: reaction mechanisms.
^{24}Mg(^{16}O,X): 1991Fo08, 1985Sa11, 1981Nu02, 1980Sa31, 1980Sa12, 1980Pa08, 1979Le02, 1979Cl02, 1973Ho37.
^{27}Al(^{16}O,t): 1982Aw01, 1981Aw02: reaction mechanism.
^{39}K(p,p),(p,α):resonances: 1987WaZI, 1990Bu02, 1970De30: see dataset.
^{40}Ca(^{40}Ca,X): 1997Sc40: giant quadrupole resonance.
^{40}Ca(p,π^-): 1983Sh31: E=190 MeV. Measured σ.
^{40}Ca(p,pα),(p,2p):resonances: 2001Sc25: see dataset.
Photonuclear reactions: ^{40}Ca(γ,n),(γ,p),(γ,2n),(γ,pn), etc: 1974Br15, 1972Br58, 1971Sh23, 1971Is06, 1968Go29, 1966An03, 1964Ba24.
^{40}Ca(γ,π): 2002Kr02: deduced DELTA resonance. Others: 1988St12, 1982Do12.
^{40}Ca(e,X): 1976Zi02.
^{40}Ca(μ^-,ν): 2003Po09: photon asymmetry measured in radiative muon capture in ^{40}Ca.
^{40}Ca(π+,K+): 1991Pi07.
^{40}Ca(K,π^-): 1981Be17, 1989Ta16: hypernuclear production.
^{40}Ca(p-bar,X): 2002Ha01, 2001Tr23, 2001Tr19: measured anti-protonic x-rays.
^{40}Ca(p-bar,p-bar): 1984Ga32.
^{40}Ca(p,np): 1984Ah04 (also 1983AhZY): deduced neutron hole states.
^{40}Ca(pol p,pol n): 1986Wa28: deduced spin-flip probability.
^{40}Ca(^{20}Ne,^{16}Oα): 1986Sh30.
Hyperfine structure, isotope shifts, nuclear radius measurements: 2000Mu17, 2000Ga58, 1995Ku41, 1993Si20, 1992Ve02, 1992Ma20, 1991As06, 1990Go10, 1984Va08, 1983Lo13, 1982Ay02, 1982An15, 1980Be13, 1979Kl01, 1978Br31, 1976Ne08.
Mesic atoms: 1983Ku10, 1981Wo02, 1980Po01, 1979Ba07, 1971Ku08, 1970Ma26, 1970Ku03, 1966Co02.
Mesic atoms, in most studies, deduced isotope shifts, root-mean square radius.
1983Ku10, 1980Po01, 1979Ba07, 1970Ku03: measured pionic x rays.
1981Wo02, 1970Ma26, 1966Co02: measured muonic x rays.
1971Ku08: measured kaonic x rays.
Giant (dipole, quadrupole and octupole) resonances: see inelastic scattering datasets: ^{40}Ca(e,e′); (π^+,$\pi^{+\prime}$),(π^-,$\pi^{-\prime}$); (p,p′),(pol p,p′); (d,d′),(pol d,d′); (^{3}He,^{3}He′); (α,α'); (HI,HI′).
In XREF column, level population indicated by letter Z or z refers to the following level energies in different reactions:.
^{41}Ti εp decay (80.4 ms): 0, 3352.62, 3736.69, 3904.
^{44}V $\varepsilon\alpha$ decay (111 ms): 0.
^{14}N(^{28}Si,d): 6930, 8098.
^{36}Ar(^{7}Li,t): 3900, 5265, 5615, 6290, 6525, 7010.
^{36}Ar(^{16}O,^{12}C): 3353, 3900, 5250, 6900, 9900, 12400.
^{40}Ca(p,pα),(p,2p):resonances: 11700, 12300.
^{40}Ca(t,t),(pol t,t): 0.
Inelastic scattering: 0, 3740, 3900, 4490, 5900, 6290, 6400, 6940, 7300. Giant resonances at 7.8, 10.7, 14.0, 17.6 and 26 MeV.
^{42}Ca(^{16}O,^{18}O): 0.

^{40}Ca Levels

Cross Reference (XREF) Flags

A	^{40}K β^- decay (1.248×10^9 y)	M	^{40}Ca(n,n′),(pol n,n′)	Y	^{40}Ca(π^+,$\pi^{+\prime}$),(π^-,$\pi^{-\prime}$)
B	^{40}Sc ε decay (182.3 ms)	N	^{40}Ca(n,n′γ)	Z	^{41}Ti εp decay (80.4 ms)
C	^{32}S(^{12}C,α)	O	^{40}Ca(p,p′),(pol p,p′)	AA	^{44}V $\varepsilon\alpha$ decay (111 ms)
D	^{36}Ar(α,γ):resonances	P	^{40}Ca(p,p′γ)	AB	^{14}N(^{28}Si,d)
E	^{36}Ar(^{6}Li,d)	Q	^{40}Ca(d,d′),(pol d,d′)	AC	^{36}Ar(^{7}Li,t)
F	^{38}Ar(^{3}He,n)	R	^{40}Ca(^{3}He,^{3}He′)	AD	^{36}Ar(^{16}O,^{12}C)
G	^{39}K(p,γ)	S	^{40}Ca(α,α')	AE	^{40}Ca(p,pα),(p,2p):resonances
H	^{39}K(p,p),(p,α):resonances	T	^{40}Ca(α,$\alpha'\gamma$)	AF	^{40}Ca(t,t),(pol t,t)
I	^{39}K(d,n)	U	^{41}Ca(d,t)	AG	Inelastic scattering
J	^{39}K(^{3}He,d),(^{3}He,dγ)	V	^{41}Ca(^{3}He,α)	AH	^{42}Ca(^{16}O,^{18}O)
K	^{40}Ca(γ,γ')	W	^{42}Ca(p,t)		
L	^{40}Ca(e,e′)	X	(HI,xnγ)		

Nuclear Level Sequences

A 4p-4h, 0+ band. Q(transition)=0.74 *14* from life-time data; corresponds to $\beta_2\approx$0.27.
B γ sequence based on 8+.
C 3+ band.
D Kπ=0- band (2004To07) (?). This band proposed (2004To07) as a partner of 4p-4h band based on 3353,0+ state; the 1-, 3- and 5- members of this band are proposed at 5902, 1-; 6280, 3- or 6580, 3-; and 7399, (5-), respectively. However, 7399 level is assigned (5+) in another in-beam γ-ray study. Assignment of (7-) by 2004To07 for 9033 level is inconsistent with L(p,p′)=5 for a 9029 *5* group and γ′s to 3- and 4- states seen in (p,γ). The 7- assignment is only possible if 9033 level in 2004To07 is different from a 9032 seen in other reactions.
E SD band (2001Id01,2003Ch22). Q(transition)=1.30 *15* over the whole band; 1.81 *+46-33* for high-spin states; 1.18 *14* for low-spin states (2003Ch22). Q(transition)=1.80 *+39-29* (2001Id01). Q(transition) from 2001Id01 corresponds to β_2=0.59 *+11-7*. Configuration=8p-8h defined by $\pi3^4\nu3^4$, where superscripts are the number of protons and neutrons occupying the N=3 ($f_{7/2}$) intruder orbital.

Seq.	E(level)†	J$^{\pi}$‡	T or Γ#	XREF	Comments
	0.0	0+	STABLE	ABCDEFG IJKLMNOPQRSTUVWXY	Double β decay ($\varepsilon\varepsilon$) is possible, but only limits have been set on half-life from measurements. T$_{1/2}$: experimental limits from 2$\varepsilon\varepsilon$ decay (2001Be79,1999Be64): >3.0×10^{21} y for 0-neutrino mode; >5.9×10^{21} y for 2-neutrino mode. Jπ: L(α,α')=L(^{3}He,n)=L(p,t)=0. Adopted (1977En02) neutron pickup spectroscopic factor=0.85 *9* (L=3).
A	3352.62 *9*	0+	2.16 ns *6*	C EFG IJ LMNOPQRS UVWXY	Jπ: L(α,α')=L(^{3}He,n)=L(p,t)=0; E0 excitation in (e,e′). Adopted (1977En02) neutron pickup spectroscopic factor=0.01 *1* (L=3). Adopted (1977En02) proton stripping spectroscopic factor<0.7 (L=2).
	3736.69 *5*	3-	47 ps *6*	BC E G IJ LMNOPQRSTUVWXY	μ=+1.65 *33* (1989Ra17,1979Ni04). μ: from tilted-foil hyperfine field IPAC in (α,α')(1979Ni04). Others: +1.6 *3* (recoil into gas in (α,α'),1976Ja16); 1.56 *30* (IMPAC, relative to G-factor for 4491 level in (α,α'),1987Ma25). Jπ: L(α,α')=L(^{3}He,n)=L(p,t)=3; E3 excitation in (e,e′). Adopted (1977En02) neutron pickup spectroscopic factor=0.16 *4* (L=0), 0.48 *13* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.01 *1* (L=1), 0.55 *6* (L=3).

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^{40}Ca Levels (continued)

Seq.	E(level)†	J$^{\pi}$‡	T or Γ#	XREF	Comments
A	3904.38 *3*	2+	34 fs *2*	C EFG IJKLMNOPQ ST WXY	Jπ: L(α,α′)=L(^{3}He,n)=L(p,t)=2; E2 excitation in (e,e′) and (γ,γ′). Adopted (1977En02) neutron stripping spectroscopic factor<0.2 (L=2).
	4491.43 *4*	5-	295 ps *5*	BC E G IJ LMNOPQRSTUVWXY	μ=+2.6 *5* (1989Ra17,1974He13). Jπ: L(α,α′)=L(p,t)=5; E5 excitation in (e,e′). μ: iPAD method in (p,p′γ)(1974He13). Adopted (1977En02) neutron pickup spectroscopic factor=0.96 *19* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.84 *9* (L=3).
E	5211.56 *17*	0+	1.1 ps *2*	C e G j NOP WX	Jπ: L(p,t)=L(^{6}Li,d)=0.
	5248.79 *5*	2+	0.11 ps *3*	c e G jKL NOP RS WX	Jπ: L(p,t)=L(^{6}Li,d)=2; E2 excitation in (e,e′).
A	5278.80 *6*	4+	0.230 ps *35*	c E G j NOP S X	Jπ: L(^{6}Li,d)=4; γ(θ) in (HI,xnγ).
	5349 *5*			t W	
	5613.52 *3*	4-	0.67 ps *10*	Bc G IJ NOP TUV X	Jπ: γ(θ) in (HI,xnγ). But (pol p,p′) gives 2+. Adopted (1977En02) neutron pickup spectroscopic factor=0.77 *13* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.91 *10* (L=3).
E	5629.41 *6*	2+	53 fs *12*	c E G KL NOP RST WX	Jπ: L(p,t)=2; E2 excitation in (e,e′). Ref: L: 5610.
	5902.63 *7*	1-	18 fs *3*	C E G IJKL NOP S VW	Jπ: L(p,t)=L(^{6}Li,d)=1. 2004To07 propose this as 1- member of Kπ=0- band. Adopted (1977En02) neutron pickup spectroscopic factor<0.01 (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.05 *2* (L=1), <0.13 (L=3). Ref: C: 5900.
	6025.47 *5*	2-	0.15 ps *3*	e G IJ NOP s UVw	Jπ: L(d,n)=1+3; (pol p,p′). Adopted (1977En02) neutron pickup spectroscopic factor=0.14 *4* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.05 *2* (L=1), 0.24 *4* (L=3).
C	6029.71 *6*	3+	0.38 ps *7*	e G N P s wX	Jπ: L(^{6}Li,d)=3.
	6160	(3-)		L ST	Jπ: L(α,α′)=(3). Ref: S: ?. Ref: T: 6100.
	6285.15 *4*	3-	0.34 ps *5*	C E G IJ L NOP RST VW Y	Jπ: L(α,α′)=L(p,t)=L(^{6}Li,d)=3. 2004To07 propose this as possible (3-) member of Kπ=0- band. Adopted (1977En02) neutron pickup spectroscopic factor=0.05 *2* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.50 *7* (L=1), <0.1 (L=3).
	6422.4 *10*	(2+)	9 fs *1*	K O	Jπ: E2 excitation in (γ,γ′).
	6507.87 *13*	4+	125 fs *24*	c E G NOP S WX	Jπ: L(p,t)=L(^{6}Li,d)=4.
E	6542.80 *9*	4+	125 fs *24*	c E G NOP S X	Jπ: L(^{6}Li,d)=4. Ref: N: ?. Ref: S: ?.
	6582.47 *10*	3-	0.17 ps *3*	Bc E G IJ L NOP RSTUVW Y	Jπ: L(α,α′)=L(p,t)=L(^{6}Li,d)=3. 2004To07 propose this as possible (3-) member of Kπ=0- band. Adopted (1977En02) neutron pickup spectroscopic factor=0.04 *1* (L=0), 0.24 *4* (L=2).

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
					Adopted (1977En02) proton stripping spectroscopic factor=0.18 *2* (L=1), <0.2 (L=3). Ref: N: ?. Ref: T: 6560.
	6750.41 *7*	2-	135 fs *25*	E G IJ NOP S UVW Y	Jπ: (pol p,p′); but L(^{6}Li,d)=2 gives 2+ Adopted (1977En02) neutron pickup spectroscopic factor=0.20 *4* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.16 *2* (L=1), 0.44 *8* (L=3). Ref: S: ?.
	6908.70 *8*	2+	2.35 fs *30*	c E G KL NOP W	Jπ: L(p,t)=L(^{6}Li,d)=L(p,p′)=2.
A	6930.2 *3*	6+	0.34 ps *+9-17*	c E j NOP uV X	Jπ: L(^{6}Li,d)=6; γ(θ) in (HI,xnγ).
	6931.29 *6*	3-	1.4 ps *6*	c G j L NO rstuV	Jπ: (3-,4+) from γ′s to 2+, 4- and 5-; (1:6)- from L(^{3}He,α)=2.
	6938.0 *18*	(1- to 5-)	0.42 fs *17*	c P rstu	Jπ: γ to 3-.
	6950.48 *7*	1-	0.95 fs *4*	c FG IJKL NOP stuVW	Jπ: L(p,t)=L(^{3}He,n)=1. Adopted (1977En02) neutron pickup spectroscopic factor=0.06 *2* (L=2). Adopted (1977En02) proton stripping spectroscopic factor=0.40 *7* (L=1), <0.5 (L=3).
	7100	(2+)		L	
	7113.1 *10*	1-	55 fs *28*	G ij P w	Jπ: L(p,t)=0+2 gives (3,4)-.
	7113.73 *5*	4-	76 fs *30*	G ij OP S UVw	Jπ: L(p,t)=(3); L(p,p′)=5; γ-decay modes. Ref: S: 7120.
	7239.07 *8*	(3-,4,5-)	0.10 ps *5*	G OP	Jπ: γ′s to 3- and 5-.
	7277.82 *8*	(2,3)+	49 fs *35*	c G OP	Jπ: γ to 3-.
	7300.67 *11*	0+	118 fs *35*	c E G OP S W	Jπ: L(α,α′)=L(p,t)=L(^{6}Li,d)=0.
C	7397.2 *10*	(5+)	0.47 ps *14*	OP X	Jπ: γ to 4+. 2004To07 proposed this as (5-) member of Kπ=0- band.
	7421.9 *15*	(2+ to 6+)	0.20 ps *14*	OP W	Jπ: γ to 4+.
	7446.23 *6*	(3,4)+	0.14 ps *5*	G OP W	Jπ: γ to 2+.
	7466.35 *7*	2+	7.6 fs *40*	E G OP ST W	Jπ: L(p,t)=2. Ref: S: ?. Ref: T: 7500.
	7481			G	
	7532.26 *5*	2-	0.16 ps *3*	G IJ OP V	Jπ: L(^{3}He,d)=1; L(^{3}He,α)=2; L(p,p′)=3; not 3- from (p,γ); not 4- from γ decay modes.
	7561.17 *7*	4+	0.14 ps *4*	E G OPQ S W	Jπ: L(^{6}Li,d)=4. Ref: S: ?.
	7623.11 *8*	(2-,3,4+)	0.11 ps *3*	G OP W	Jπ: γ′s to 2+ and 4-; but L(p,t)=0. Ref: W: ?.
	7658.23 *5*	4-	<10 fs	B G iJ OP uVW	T=1 . Jπ: log *ft*=3.3 from 4-.
	7676.6 *5*	(6+)	0.21 ps *5*	G i OP u X	Jπ: γ(θ) in (HI,xnγ).
	7694.08 *4*	3-	<10 fs	G IJ OP s uVW	T=1 . Jπ: L(d,n)=1; γ′s to 3- and 4-.
	7701.8 *4*	0+	0.20 ps *5*	E G O s W	Jπ: L(^{6}Li,d)=0.
	7769.4 *10*	(3,4,5-)	166 fs *35*	G OP W	Jπ: γ′s to 3- and 4-.
	7814.7 *6*	0+		F OP W	Jπ: L(^{3}He,n)=0.
	7870	(3-)		E	Jπ: L(^{6}Li,d)=3.
	7872.18 *9*	2+	2.0 fs *2*	E G Kl OP S W	Jπ: L(p,t)=2; 2+,4+ in (γ,γ′). Ref: E: 7900.
	7928.42 *10*	4+	49 fs *35*	G l OP rS W	Jπ: L(α,α′)=4.
	7972.5	(≤ 3)-		c r w	Jπ: L(d,n)=1.
E	7974.4 *8*	(6+)		G X	
	7976.55 *3*	2+	21 fs *21*	c I OP r w	Jπ: γ′s to 0+ and 4+.

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	8018.8 *10*	0+		c OP W	Jπ: L(p,t)=0.
	8051.8 *6*			O	
	8091.61 *17*	2+	3.0 fs *2*	c EFG K OP S W	Jπ: L(α,α′)=2; E2 excitation in (γ,γ′); but L(p,t)=4. Ref: E: 8050. Ref: F: 8050.
B	8098.9 *7*	8+	12.5 ps *17*	c X	Jπ: ΔJ=2, E2 γ to 6+.
	8113.2 *5*	1(-)	38 fs *17*	c E i K OP WX	Jπ: dipole excitation in (γ,γ′); L(^{6}Li,d)=1. Ref: E: 8150.
	8134.77 *10*	(2-,3,4+)	<28 fs	c G i OP	Jπ: γ′s to 2+ and 4-.
	8187.5 *8*	(3,4,5-)	<17 fs	G i OP w	Jπ: γ to 3-.
	8195.9 *6*			O w	
	8271 *1*	(≤ 3)-		IJ OP S	Jπ: L(d,n)=1; γ′s to 1- and 2-. Ref: S: ?.
	8276 *1*	0+		EF OP W	Jπ: L(p,t)=L(^{3}He,n)=0. But L(^{6}Li,d)=4 is also suggested for a 8270 group.
	8323.16 *8*	(1-,2+)	55 fs *20*	c G OP	Jπ: γ′s to 0+ and 3-.
	8338.0 *3*	(2+ to 5-)		c G O W	Jπ: from (p,γ).
	8358.9 *6*	(0,1,2)-	100 fs *25*	c IJ OP	Jπ: L(d,n)=1; γ to 1-; RUL.
	8364 *5*	(3- to 7-)		P	Jπ: γ to 5-.
	8373.94 *15*	4+		E G O S VW	Jπ: L(α,α′)=L(p,t)=4. Ref: E: 8380.
	8424.81 *11*	2-	<17 fs	G IJ L OP uV	T=1 . Jπ: M2 excitation in (e,e′).
	8439.0 *5*	0+		EfG j OP r W	Jπ: L(p,t)=0. Ref: E: ?.
	8484.02 *13*	0+	24 fs *14*	fG j OP r u W	Jπ: L(p,t)=0.
	8540 *4*	(1,2+)	14 fs *14*	e P uv	Jπ: γ to 0+.
	8551.1 *7*	5-	<17 fs	e IJ L OP uvW	T=1 . Jπ: L(p,t)=5. Ref: L: 8500.
	8578.80 *9*	2+	4.9 fs *6*	c e G K OP s w	Jπ: E2 excitation in (γ,γ′).
	8587 *2*	(2+,3)		c e P s w	Jπ: γ′s to 2+, 2- and 4+.
	8631	5		OP	
	8665.3 *8*	1-		I OP	Jπ: L(d,n)=1; γ to 0+. Ref: P: 8670.
	8678.29 *10*	4+	40 fs *35*	G P W	Jπ: L(p,t)=4.
	8701 *1*	(6-)		X	Jπ: γ′s to 4- and 5-.
	8717 *8*			P	
	8748.22 *9*	2+	6.9 fs *14*	e G i K OP T	Jπ: E2 excitation in (γ,γ′). Ref: P: 8756. Ref: T: 8700.
	8764.18 *6*	3-		c G i P W	Jπ: L(p,t)=3. Ref: P: 8769.
	8810 *7*	(2+)		c e OP S	Jπ: L(α,α′)=2. Ref: P: 8819.
	8850.6 *9*	(6,7,8)-		I OP W	Jπ: L(p,p′)=7. Ref: P: 8860.
	8909.0 *9*			O W	
	8934.81 *7*	2+		E G i P	Jπ: L(^{6}Li,d)=2. Ref: P: 8922.
C	8935.8 *9*	(7+)		X	
	8938.4 *9*	0+		i OP U W	Jπ: L(p,t)=0. Ref: P: 8949. Ref: U: ?.
	8980 *5*	(5,6,7)+		O U w	Jπ: L(p,p′)=6. Ref: U: ?.
	8982.5 *5*	2+	8.3 fs *14*	i K q S U w	Jπ: E2 excitation in (γ,γ′). Ref: S: 8970.

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
					Ref: U: ?.
	8994.50 *11*	(1-,2+)		G i OPq w	Jπ: γ′s to 0+ and 3-. Ref: P: 9011.
	9031.9 *3*	4-		G O VW	Jπ: γ′s to 3- and 5-; L(p,p′)=5. 2004To07 propose (7-) for this level, but γ′s to 3- and 4- states are inconsistent with this assignment.
D	9033 *1*	(7-)		X	E(level): it is possible that this level is the same as the 9031.9 seen in other reactions and the 4542γ reported by 2004To07 could correspond to 4540.2γ in (p,γ). But the most intense 3418γ from 9031.9 level is not reported by 2004To07.
	9050.1 *10*			O	
	9080.3 *11*			O v	
	9091.70 *6*	3-		G j O vw	T=(0) . Jπ: γ′s to 1-, 2+, 2-, 3- and 4+.
	9135.66 *5*	(3)-		e G Ij O Vw	T=0 . Jπ: γ′s to 1- and 4+; L(d,n)=1; L(^{3}He,α)=2.
	9162.1 *11*			e j O w	
	9185.3 *12*			j O	
	9209.77 *3*	(1,2,3)-		G O v	T=0 . Jπ: γ′s to 1- and 3-.
	9226.69 *5*	(1-,2,3-)		e G i o v	Jπ: γ′s to 1- and 3-.
	9227.43 *7*	(1,2+)		G i o v	Jπ: γ′s to 0+ and 2-.
	9246.0 *12*	(6,7,8)-		E O w	Jπ: L(p,p′)=7. But L(^{6}Li,d)=6 for a 9240 group.
	9274.5 *12*			O W	
	9304 *5*	0+		W	Jπ: L(p,t)=0.
A	9305.2 *8*	(8+)		X	
	9362.54 *6*	3-		B E G j S w	T=0 . Jπ: log *ft*=5.4 from 4-; γ′s to 2+ and 4-. Ref: S: 9340.
	9377.8 *2*			G j O w	
	9388.20 *19*	2+		G j	Jπ: γ′s to 0+ and 4+.
	9395.7 *3*	(3-,4+)		G Ij	Ref: I: 9408.
	9404.85 *19*	2-	0.14 keV	GHIj	T=1 . Jπ: γ′s to 0+ and 3-. Ref: I: 9408.
	9406.4 *6*	0+		FG j W	T=1 . Ref: F: 9380.
	9412.4 *2*			G Ij o	Ref: I: 9408.
	9418.8 *2*	3-		B G Ij o	T=1 . Jπ: log *ft*=5.6 from 4-; γ′s to 1 and 4-. Ref: I: 9408.
	9429.11 *5*	(3,4)-		B G Ij v	T=0 . Jπ: log *ft*=5.5 from 4-; γ′s to 3-, 4- and 5-. Ref: I: 9431.
	9432.46 *18*	1-	0.23 keV	GHIj v	T=1 . Jπ: γ′s to 0+, 2+ and 2-. Ref: I: 9431.
	9453.95 *5*	3-	0.09 keV	B GHIj O V	T=0 . Jπ: log *ft*=5.2 from 4-; L(d,n)=1; γ′s to 0+ and 4-. Ref: O: ?.
	9500.0 *15*	(2+)		E G S	Jπ: L(^{6}Li,d)=2.
	9536.35 *16*	(3,4)+		G	
	9537.9 *5*	1-	0.4 keV	GHI O	Ref: O: ?.
	9564 *5*	(2+)		F VW	T=(1) . Jπ: L(^{3}He,n)=2.

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
					Ref: F: 9600.
	9603.0 *4*	3-		B GHi T vw	T=1 . Jπ: log *ft*=5.6 from 4-; γ′s to 3- and 4-. Ref: T: 9600.
	9604.6 *4*	1-	0.19 keV *5*	GHi K vw	T=1 . Jπ: γ′s to 0+, 2+ and 2-.
	9640.89 *7*	2-		G vW	T=1 . Jπ: γ′s to 0+, 1-, 2+ and 3-.
	9655.6 *9*	(1,2+)		G o vw	
	9662.3 *2*	(≤ 3)-		GHi o VW	Γ: 1.8/(J(J+1)) keV.
	9668.71 *8*	3-		E G iJ V	T=1 . Jπ: γ′s to 2+, 2- and 5-.
	9779.47 *7*	3		G	T=1 . Jπ: γ′s to 2+, 4+ and 4-.
	9785.3 *2*	(1,2+)		G	Jπ: γ′s to 0+ and 2+.
	9802.2 *7*	(1,2,3)-		GH	Γ: 1.8/(J(J+1)) keV.
	9811.1 *2*	(3,4,5-)		B G	Jπ: log *ft*=6.1 from 4-.
	9829.54 *16*	(1- to 4+)		B G	Jπ: log *ft*=6.6 from 4-.
	9835.08 *19*	(2+ to 5-)		B G	Jπ: log *ft*=6.6 from 4-.
E	9853.5 *8*	(8+)		X	
	9854.54 *17*	(1,2,3)-		GH	Γ: 1.7/(J(J+1)) keV.
	9859.7 *3*	(4,5,6)-		G	
	9865.15 *11*	1	0.100 keV *24*	de G K	T=1 . Jπ: γ′s to 0+,1- and 2+.
	9869.3 *4*	1+	0.90 keV *21*	de G KL O S	Jπ: γ′s to 0+ and 2+; M1 excitation in (e,e′). But L(^{6}Li,d)=2 for 9870 group. Ref: S: 9870.
	9898.6 *3*			G L	
	9921.4 *2*	(3,4,5-)		B e G	Jπ: log *ft*=6.3 from 4-; (1-:5-) from (p,γ)
	9939.8 *2*			e G	
	9954.00 *9*	4+		B e G	T=0 . Jπ: log *ft*=7.7 from 4-; γ′s to 3- and 5-.
	9977.20 *17*	(3,4,5)		B e G	Jπ: log *ft*=7.0 from 4-.
	9993.71 *5*			G	
	10040.54 *9*	(2-,3-)		G i u	T=1 . Jπ: γ′s to 1- and 4-.
	10045.7 *5*	(3- to 7-)		G i u	
	10049.38 *7*	4-		B G i uv	T=1 . Jπ: log *ft*=6.3 from 4-; γ′s to 2-, 3- and 5-.
	10058.0 *3*			e G i o uv	
	10065 *2*	(1-,2+)		e o	T=0 . Jπ: L(^{6}Li,d)=2 for a 10080 group.
	10080.7 *2*			e G S u	
	10130.70 *19*	(3-,4+)		B G u	T=0 . Jπ: log *ft*=6.7 from 4-.
	10154 *7*	(3-,4+,5-)		B E	T=0 . Jπ: log *ft*=7.3 from 4-; L(^{6}Li,d)=5.
	10193 *7*	(3-,4+,5-)		B	T=0 . Jπ: log *ft*=7.5 from 4-.
	10199.2 *4*	(1-)	0.27 keV	GH	T=0 .
	10205.1 *8*			G	
	10210.6 *2*	(3,4)-		B G V	Jπ: log *ft*=5.7 from 4-.
	10232.8 *7*			G	
	10262.53 *10*	3-	0.4 keV	G	T=0+1. Jπ: γ′s to 0+, 1-, 2+ and 3-.
	10267.7 *5*	1-		GH	T=0 .
	10274.8 *3*	(3,4,5)+		G	
	10277.9 *2*	(1-)	1.1 keV	GH O	T=0 .

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^{40}Ca Levels (continued)

Seq.	E(level)†	J$^{\pi}$‡	T or Γ#	XREF	Comments
	10285.0 *3*	1-		GH O	
	10318.8 *4*	1+	26 eV *7*	D G KL O	T=1 . Jπ: M1 excitation in (e,e′).
	10333.7 *5*	(3-)		B GH O S	T=0 . Jπ: log *ft*=7.1 from 4-. Ref: O: ?. Ref: S: 10340.
	10358.6 *15*			E G	Jπ: L(^{6}Li,d)=8. Ref: E: 10340.
	10361.5 *15*	3-	3.9 keV	B G	T=0 . Jπ: log *ft*=7.2 from 4-.
	10362.6 *5*	1-		H	
	10364.6 *5*	1-		H	
	10376.6 *5*	1-		GH	
	10383.90 *16*	(1-,2+)		G	T=0 .
	10415.06 *6*	3		G	T=1 .
	10420.2 *5*	1-		GH	T=0 .
	10430.58 *19*	NATURAL		G	T=0 .
	10443.4 *5*	2-		GH	Ref: γ: 10441.4.
	10443.9 *2*	3-	0.44 keV	B G	T=0 . Jπ: log *ft*=6.2 from 4-.
	10446.8 *5*	1-		H	
	10470.0 *15*	(3,5)-		B G	T=0 . Jπ: log *ft*=5.7 from 4-.
	10474 *2*			X	Jπ: γ to (6-); (8-) proposed by 2004To07.
	10478.71 *5*			G	
	10503.1 *15*	(3,4,5)-		B G	Jπ: log *ft*=5.5 from 4-.
	10514.8 *15*	(3-,4+,5-)		B G	T=0 . Jπ: log *ft*=6.7 from 4-.
	10516.3 *5*	1-		H	
	10529.6 *5*	(1+)		GH	
	10541.5 *5*	0+		GH	T=0 . Jπ: 2+ in (p,γ).
	10552.2 *15*			e G	
	10583 *5*	(3,4,5)		B	Jπ: log *ft*=6.3 from 4-.
	10596.2 *5*	3-		B E H S	T=0 . Jπ: log *ft*=6.5 from 4-. Ref: E: 10590.
	10598.4 *5*	(1+)		H	
	10607.4 *5*	0(+)		f H	
	10618.6 *5*	2-		H	
	10621.4 *5*	0+		f H	T=0 . Jπ: 1- is also proposed.
	10633.6 *5*	(1-)		GH	
	10639.07 *7*	(3-,4,5-)		G	T=1 .
	10646.4 *4*	NATURAL		fG	T=0 .
	10653.23 *16*	(1- to 4+)		GH L s	Ref: L: 10680.
	10657.4 *5*	2+	0.35 keV	H	T=0 .
	10666.4 *5*	2-		H	
	10670.4 *3*	1-	5.7 keV	G	
	10673.69 *17*	(2-)		G L	Jπ: M2 excitation in (e,e′). Ref: L: 10676.
	10675.4 *5*	1-	0.33 keV	GH	T=0 .
	10691.0 *3*	2+	0.14 keV	B GH	Jπ: 1+ is also possible.
	10699.50 *10*	3		B E G L	Jπ: log *ft*=6.6 from 4-. But L(^{6}Li,d)=7 for 10690. Ref: L: 10680.
	10700.9 *5*	0+		H	
	10720.8 *3*	(3,5)-		B G	T=0 .

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^{40}Ca Levels (continued)

Seq.	E(level)†	J$^{\pi}$‡	T or Γ#	XREF	Comments
					Jπ: log *ft*=5.7 from 4-.
	10722.1 *5*	1+		H	
	10737.7 *3*	1-	0.5 keV	E G	T=0+1 . Ref: E: 10700.
	10740.1 *5*	1-		H	
	10747.8 *4*	4+		G	T=0 .
	10748.8 *5*	0+		H	
	10753.85 *18*	(3,4,5)		B G	Jπ: log *ft*=6.5 from 4-.
	10770.2 *3*	(1+)		GH	Ref: H: 10772.1.
	10776.3 *3*	3-	12 keV	B G L S	T=0 . Jπ: log *ft*=5.3 from 4-; 1- in (e,e′) for 10776. Ref: L: ?. Ref: S: 10800.
	10780.5 *5*	(3-)		H	
	10780.9 *3*	2+	0.18 keV	GH	T=0 . Ref: H: 10778.2.
	10783.1 *5*	(0-)		H	
	10787.7 *3*			E G	Ref: E: ?.
	10800.0 *10*	(1-,2+)		G	T=0 .
	10802.6 *5*	0(+)		H	
	10813.7 *5*	(3-,4+,5-)		B e G	T=0 . Jπ: log *ft*=6.3 from 4-; L(^{6}Li,d)=5. Γ: 13/(J(J+1)) keV.
	10816.2 *5*	2-		H	
	10816.4 *5*	3+		H	
	10830.0 *6*	NATURAL		e G	T=0 .
	10833.0 *5*	3(-)		e H	
	10848.5 *4*	(3,5)-		B e G	T=0 . Jπ: log *ft*=5.8 from 4-.
	10849.2 *5*	2-		H	
	10852.0 *5*	(1-,2-)		H	
	10861.3 *5*	2+	0.045 keV	H	T=0 .
	10868.9 *5*	1-		GH	
	10869.5 *5*	0+		H	
	10873.7 *5*	1-		H	
D	10895 *1*	(9-)		X	
	10899.1 *5*	1+		H	
	10910.0 *4*	(3,4,5)	2.3 keV	B e G	T=0 . Jπ: log *ft*=6.8 from 4-; L(^{6}Li,d)=3 for 10900
	10914.6 *5*	1-		H	
	10915.6 *5*	3+		H	
	10921.1 *4*	(2+,3,4+)		e G	
	10932.5 *5*	1-	2.0 keV	GH	T=0 .
	10933.2 *5*	2-		H	
	10946.8 *5*	2+	0.23 keV	H	T=0 .
	10950.7 *5*	1-	10 keV	GH	T=0 .
	10953.4 *5*	0(+)		H	
	10956.0 *4*	(3-,4+,5-)		B G	T=0 . Jπ: log *ft*=6.0 from 4-.
	10976.3 *15*	(3,4,5)		B G l	Jπ: log *ft*=6.0 from 4-.
	10988.0 *4*	(3-,4+,5-)		B G l W	T=0 . Jπ: log *ft*=7.2 from 4-.
	10988.5 *5*	2-		H	
	10989.2 *5*	(1+)		H	
	10994.7 *4*	(1-)	6.7 keV	G	
	10998.7 *5*	1-,3-	0.20 keV	H	
	11002.4 *5*	(1,3)-		G l	T=0 .
B	11003.0 *9*	(10+)		X	
	11007.0 *5*	1-	5.0 keV	H	

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	11011.0 *4*	3-	0.3 keV	G l	T=0+1 .
	11024.0 *5*	(1-,3-)	0.27 keV	GH	T=0 .
	11036.1 *5*	(1+)		H	
	11038 *7*	(3,4,5)		B	Jπ: log *ft*=6.4 from 4-.
	11044.3 *5*	2+	0.50 keV	GH	T=0 .
	11070.6 *4*	(1- to 4+)		G	
	11073.3 *5*	2+		H	
	11078.2 *5*	1-		e GH	T=0 .
	11083.4 *5*	(1+)		H	
	11087 *3*	(3-,4+)		B	T=0 . Jπ: log *ft*=7.1 from 4-.
	11089.1 *5*	0(+)		E H	Ref: E: 11100.
	11106.8 *5*	1-	5.2 keV	H	
	11118.8 *5*	2+	0.046 keV	B GH S	Ref: S: 11100.
	11128.9 *5*	4+	0.11 keV	FG	T=0 .
	11143 *6*	(3,4,5)-		B	Jπ: log *ft*=5.8 from 4-.
	11145.0 *5*	1(-)		H	
	11145.6 *5*	1+		H	
	11157.0 *5*	2-		H	
	11161.3 *5*	4+	0.040 keV	H U	T=0 .
	11162.7 *5*	2+		H	
	11167.2 *5*	4+	0.083 keV	GH	T=0 . Ref: γ: 11165.3.
	11187.4 *5*	3-	1.4 keV	H j	
	11202.7 *5*	(3)-		B H j u	T=0 . Jπ: log *ft*=5.5 from 4-; ^{39}K(p,p).
	11210	(0+)		E j	Jπ: L(^{6}Li,d)=0.
	11212.4 *5*	3-	2.8 keV	H j	
	11217 *3*	3-	25 keV	B j u	Jπ: log *ft*=5.2 from 4-.
	11217.6 *5*	4+	1.4 keV	H j	
	11231.2 *5*	2-		H u	Γ: 3/(J(J+1)) keV.
	11236 *3*	1-	12 keV	H u	
	11246.6 *5*	3-	0.092 keV	H u	T=0 .
	11255.7 *5*	1+		H	
	11260.6 *5*	(0-)		H	
	11264.2 *5*	2+	0.34 keV	H	T=0 .
	11284.1 *5*	(2-)		H	
	11289.6 *5*	1+		H	
	11300.1 *5*	1+		H	
	11302.3 *5*	(1-)		H	
	11311 *4*	(3-,4+,5-)		B E u	T=0 . Jπ: log *ft*=6.2 from 4-.
	11319.8 *5*	(0-)		H	
	11321.8 *5*	2+	0.52 keV	H	T=0 .
	11329.1 *5*	2+		H	
	11330.5 *5*	1-	4.0 keV	e H	T=0 .
	11338.5 *5*	(1+)		H	
	11342.4 *5*	2-		H	
	11346.2 *5*	4(+)		H	T=0 .
	11351.3 *5*	1+		H	
	11362.2 *5*	1+		H	
	11365.8 *5*	2+	0.19 keV	H	T=0 .
	11366.8 *5*	2-		H	
	11368.1 *5*	4(+)	0.020 keV	H	
	11370	(5-)		E	Jπ: L(^{6}Li,d)=5.
	11371.2 *5*	2+	1.4 keV	H	
	11381.9 *5*	2+	2.6 keV	H	T=0 .
	11392.8 *5*	1(-)	0.10 keV	H	

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	11404.0 5	1-	3.5 keV	H	T=0 .
	11406.8 5	1+		H	
	11414.6 5	4+	0.10 keV	B H	T=0 . Jπ: log ft=6.4 from 4-.
	11420.1 5	3-	0.30 keV	H	
	11432.5 5	1-	0.30 keV	H	T=0 .
	11436.6 5	2+	0.22 keV	H	T=0 .
	11447.0 5	1-	5.3 keV	b H	T=0 .
	11451.2 5	1+		H	
	11455.2 5	3-	0.060 keV	b H S	T=0 . Ref: S: 11470.
	11460.2 5	2+	1.17 keV	E H	T=0 .
	11464.9 5	2(+)	0.13 keV	H	
	11468 3	(3-,4+,5-)		B E	T=0 . Jπ: log ft=6.2 from 4-; L(^{6}Li,d)=5.
	11468.5 5	2-		H	
	11479.6 5	1+		H	
	11486.5 5	0+	0.11 keV	H	
	11489.4 5	1+		H	
	11514.4 5	2+	0.62 keV	H	
	11515.0 5	1(-)	4.23 keV	H	
	11518.8 5	2+		H	
	11537.7 5	2-		H	
	11542.0 5	2+	0.62 keV	H	
	11543.5 5	(1+)		H	
	11546.5 5	2-		H	
	11549 5	(3,5)-		B	T=0 . Jπ: log ft=5.9 from 4-.
	11554.3 5	1-	0.95 keV	H	
	11558.9 5	(2+)		H	
	11563.3 5	(2-)		H	
	11577.7 5	2-		H	
	11577.8 5	2+	0.23 keV	H	
	11585.4 5	2-		H	
	11597.0 5	(2+)		H	
	11602.1 5	2+		H	
	11603.2 5	2+	0.28 keV	H	
	11605.1 5	1-	13 keV	H	
	11610.9 5	1-	0.86 keV	H	
	11613.8 5	(2-)		H	
	11617 10	(3,4,5)		B u	Jπ: log ft=6.3 from 4-.
	11628.3 5	(3+)		H	
	11628.9 5	2+	0.085 keV	H	
	11637.9 5	1-	0.09 keV	H	
	11644.8 5	(2-)		H	
	11646.7 5	2+	0.60 keV	H	
	11650.6 5	2(+)	0.18 keV	H	
	11652.0 5	3-		H	
	11653.3 5	2+	1.59 keV	H	
	11661.5 5	1-	1.56 keV	H	
	11663 6	(3-,4+,5-)		B u	T=0 . Jπ: log ft=6.2 from 4-.
	11672.6 5	(2-)		H	
	11676.9 5	2+	0.96 keV	H S	Ref: S: 11690.
A	11685.8 9	(10+)		X	
	11687.9 5	(1+)		H	
	11689.0 5	(2-)		H	
	11690	(7-)		E	Jπ: L(^{6}Li,d)=7.
	11692.6 5	4(+)	0.021 keV	H	

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	11696.1 *5*	0(-)		H	
	11703.4 *5*	0+	4.65 keV	H	
	11704.4 *5*	2-		H	
	11707.6 *5*	1-	0.30 keV	H	
C	11708.7 *12*	(9+)		X	
	11713.4 *5*	1+		H	
	11715.5 *5*	2-		H	
	11721.0 *5*	1+		H	
	11723.9 *5*	3(-)	0.060 keV	H	
	11726 *5*	(3,5)-		B u y	T=0 . Jπ: log *ft*=5.7 from 4-.
	11730.8 *5*	1(-)	3.6 keV	H	
	11730.9 *5*	1+		H	
	11738.6 *5*	2+		H	
	11742.6 *5*	4+	1.07 keV	H	
	11744.4 *5*	1(-)	0.55 keV	H	
	11749.3 *5*	2-	2.57 keV	H	
	11753.2 *5*	3-		H	
	11753.8 *5*	1+	0.35 keV	H	
	11757.1 *5*	2-		H	
	11767.8 *5*	3(-)	0.041 keV	H	
	11775	(1+)		L	
	11782.4 *5*	3(-)	0.041 keV	H	
	11788.3 *5*	2+	2.5 keV	H	
	11792.2 *5*	1+		H	
	11799.0 *5*	4(+)	0.18 keV	B H u y	Jπ: log *ft*=6.0 from 4-.
	11803.9 *5*	0+	0.26 keV	H	
	11808.9 *5*	(1+)		H	
	11810.7 *5*	2+	1.8 keV	H	
	11811.4 *5*	3-	0.26 keV	H	
	11820.4 *5*	3-	3.5 keV	H	
	11830.6 *5*	2+	0.30 keV	H	
	11839.0 *5*	0+	1.05 keV	H	
	11841 *6*	(3-,4+,5-)		B E	T=0 . Jπ: log *ft*=5.9 from 4-; L(^{6}Li,d)=5 for 11800 Ref: E: 11800.
	11843.9 *5*	1+		H	
	11855.6 *5*	2+	0.39 keV	H	
	11857.1 *5*	(1+)		H	
	11863.1 *5*	(3-)	0.41 keV	H	
	11864.5 *5*	(0+)		H	
	11868.6 *5*	(4+)	0.032 keV	H	
	11869.8 *5*	3-	0.040 keV	H	
	11872.0 *5*	2+	0.87 keV	H	
	11877.8 *5*	1-	0.32 keV	H	
	11884.3 *5*	1+		H	
	11888.1 *5*	4+	0.13 keV	H	
	11890.7 *5*	1-		H	
	11893.8 *5*	(2-)		H	
	11901.2 *5*	1+		H	
	11915.7 *5*	3-	1.0 keV	H	
	11924.4 *5*	2+	2.2 keV	H	
	11929.8 *5*	4(+)	0.030 keV	H	
	11933.1 *5*	1-	16.1 keV	H	
	11934.8 *5*	1+		H	
	11937.1 *5*	2-		H	
	11940.2 *5*	1+		H	
	11942.6 *5*	3-	0.48 keV	H	
	11944.8 *5*	1-	0.40 keV	H	

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^{40}Ca Levels (continued)

Seq.	E(level)†	J$^{\pi}$‡	T or Γ#	XREF	Comments
	11948.2 *5*	0+	0.31 keV	H	
	11958.5 *5*	(2+)	1.0 keV	H S	Ref: S: 11940.
	11962.7 *5*	0+	0.30 keV	H	
	11969.6 *5*	1+		H	
	11970.8 *5*	2+	0.26 keV	H	
	11974.9 *5*	1-	0.055 keV	D H	
	11983.1 *5*	(2-)	1.0 keV	H	
	11986.9 *5*	3-	0.38 keV	D H	
	11988 *1*	0+	81 eV *10*	D F W	T=2 . Jπ: L(^{3}He,n)=0; IAR state. %α=93 *9* to ^{36}Ar g.s.; %α<3% to first 2+ in ^{36}Ar; %p<5% ro ^{39}K g.s.
	11993.8 *5*	0-		D H	
	12000 *5*	(3,5)-		B	T=0 . Jπ: log *ft*=5.4 from 4-.
	12001.1 *5*	(2+)	1.02 keV	D H	
	12007.2 *5*	1+		H	
	12010.2 *5*	2-		H	
	12012.0 *5*	4+	0.010 keV	H	
	12023.4 *5*	1+		H	
	12026.7 *5*	4+	0.22 keV	H	
	12033.6 *5*	3-	0.31 keV	H	
	12038 *3*	(3,4,5)-		B G O	Jπ: log *ft*=5.8 from 4-.
	12047.5 *5*	2+	2.65 keV	e GH L	
	12056.2 *5*	2+		e H	
	12058.7 *5*	1-	1.11 keV	H	
	12067.1 *5*	2+	1.15 keV	H	
	12067.6 *5*	4+	1.11 keV	H	
	12068 *3*	(3,5)-		B	T=0 . Jπ: log *ft*=5.6 from 4-.
	12076.6 *5*	2-	3.07 keV	GH	
	12081.8 *5*	4(+)	0.021 keV	H	
	12085.9 *5*	4(+)	0.011 keV	H	
	12088.6 *5*	2-		H	
	12089.6 *5*	2+	24 keV	e H	
	12092.9 *5*	4(+)	0.060 keV	H	
	12094.9 *5*	2+	9.4 keV	De GH	
	12105.8 *5*	4(+)	0.090 keV	H	
	12110.5 *5*	2+		e GH	
	12114.9 *5*	3-	0.78 keV	H	
	12125.7 *5*	(3+)		H	
	12132.5 *5*	(4+)	0.13 keV	H	
	12134.7 *5*	(4+)	0.10 keV	H	
	12141.1 *5*	2+	1.24 keV	H	
	12152.1 *5*	4+	0.36 keV	H	
	12157.8 *5*	4(+)	0.12 keV	H	
	12159.3 *5*	4(+)	0.083 keV	H	
	12177.5 *5*	1(-)	0.22 keV	H	
	12180.0 *5*	2+	1.50 keV	E H	Ref: E: 12170.
	12184.3 *5*	2-		H	
	12192.6 *5*	2+	1.24 keV	H	
	12196.1 *5*	1(-)	0.95 keV	H	
	12201.0 *5*	3-	2.1 keV	D GH L	Jπ: from (e,e′).
	12209.1 *5*	0-		H	
	12211.7 *5*	4+	0.021 keV	H	
	12217.5 *5*	1+		H	
	12224.1 *5*	1-	1.46 keV	H	
	12226.3 *5*	2+	0.43 keV	H	
	12237.6 *5*	1+		H	

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	12243.8 *5*	4+	0.030 keV	H	
	12245.1 *5*	1-	2.0 keV	H	
	12332	(2-)		D G L	Jπ: from (e,e′).
E	12334.9 *10*	(10+)		X	
	12340	(5-)		E	Jπ: L(^{6}Li,d)=5.
	12423			D G	
	12450	(4+)		E	Jπ: L(^{6}Li,d)=4.
	12488	(1+)		L	
	12503	(2-)		L	
	12591.9 *10*	(10+)		X	
	12604			G	
	12622	(2)		L	
	12650	(7-)		E G	Jπ: L(^{6}Li,d)=7.
	12668			G	
	12688			G	
	12720	(3-)		E	Jπ: L(^{6}Li,d)=3.
	12749	(2-)		L	
	12830	(1+,2-)		L	
	12900	(4+)		E G	Jπ: L(^{6}Li,d)=4. Ref: γ: 12875.
D	12923 *2*	(11-)		X	
	12980			D G	
	12996			G	
	13049	(1+)		L	
	13050	(4+)		E	Jπ: L(^{6}Li,d)=4.
	13086			G	
	13113			G	
B	13115.1 *10*	(12+)		X	
	13147	(2-)		L	
	13194			G	
	13195 *2*	(10-)		X	Jπ: γ to (9-); 2004To07 propose (10-).
	13200	(4+)		E	Jπ: L(^{6}Li,d)=4.
	13203			G	
	13250			D	
	13289			G	
	13300	(4+)		E	Jπ: L(^{6}Li,d)=4.
	13445	(2-)		L y	
	13450	(0+)		S y	Jπ: L(α,α′)=0.
	13470	(4+)		E y	Jπ: L(^{6}Li,d)=4.
	13480	(1+)		D L y	
C	13535.5 *13*	(11+)		X	
	13620	(6+)		E	Jπ: L(^{6}Li,d)=6.
	13666	(2-)		L	
	13720	(6+)		DE	Jπ: L(^{6}Li,d)=6.
	13830	(7-)		E G	Jπ: L(^{6}Li,d)=7. Ref: γ: 13822.
	13900	(2+)		L	
	13913	(4-)		G O Q	T=(0) . Jπ: σ(θ) in (p,p′). Ref: Q: 13921.
	13953	(4+)		DE	Jπ: L(^{6}Li,d)=4. Ref: E: 14000.
	13993			G	
	14097			D	
	14190	(4+)		E	Jπ: L(^{6}Li,d)=4.
	14200	(0+)		R	Jπ: L(^{3}He,^{3}He′)=0.
A	14232.4 *10*	(12+)		X	

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	14283 *15*	(6-)		O	T=1 . Jπ: σ(θ) in (p,p′).
	14320			O	Jπ: L(p,p′)=(3).
	14370	(6+)		E H	Jπ: L(^{6}Li,d)=6. Ref: E: 14380.
	14410	(3-)		D O	Jπ: L(p,p′)=3. Ref: D: 14420.
	14460	(2+)		H o q S	Jπ: L(p,p′)=2 for 14500 group; L(d,d′)=0+2 for 14500 group; L(α,α′)=2 for 14450 group.
	14530	(6+)		DE H o q	Jπ: L(^{6}Li,d)=6. Ref: D: 14510. Ref: E: 14500.
	14600	(1,2+,3-,4+)		H L q	Jπ: from (e,e′).
	14660	(2+)		e O q	Jπ: L(p,p′)=2.
	14680			e H q	Jπ: 1+ for a 15000 group in (d,d′).
	14750	(4+)		E	Jπ: L(^{6}Li,d)=4.
	14780	(2+)		O	Jπ: L(p,p′)=2.
	14870			DE	Jπ: L(^{6}Li,d)=(9). Ref: E: 14850.
	15080			E O q	
	15140			E q	
B	15152.4 *12*	(13+)		X	
	15250			E	
E	15267.1 *14*	(12+)		X	
D	15306 *2*	(13-)		X	
	15330			E	
	15600			E	
	15700			E	
	15748.1 *14*	(12+)		X	
	15900	(3-)		S	Jπ: L(α,α′)=3.
A	16529.4 *12*	(14+)		X	
C	16579.7 *16*	(13+)		X	
	16700			R	Jπ: L(^{3}He,^{3}He′)=(3).
	17670			D Y	E(level): possibly GQR. Ref: Y: 17500.
	17698.6 *14*	(14+)		X	
	17700	(2+)		S	Jπ: L(α,α′)=2.
	17859			D	
	18054.6 *14*	(14+)		X	
	18147			D	
D	18215 *2*	(15-)		X	
	18260	(2+)		G L QRS	Jπ: L(d,d′)=0+2; L(^{3}He,^{3}He′)=2(+0). Ref: L: 18400. Ref: R: 18200. Ref: S: 18200.
	18327			D	
	18453			D	
E	18497.2 *17*	(14+)		X	
	18680			G	
	18719.2 *17*	(14+)		X	
	18732			D	
	19038			D	
	19070			G	
B	19195.6 *16*	(15+)		X	
	19450	(0+)		G S	Jπ: L(α,α′)=0. Ref: S: 19180.
	19850			G	
	20130			G	

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	T or Γ#	XREF	Comments
	20430			G	
A	20578.6 *15*	(16+)		X	
	20650			G	
	20940			G S	Jπ: L(α,α′)=0+2. Ref: S: 21000.
	21490			G	
	21690			G	
	22060			G	
E	22060.4 *20*	(16+)		X	
	23360	(1-)		K S	Jπ: L(α,α′)=1; GDR.
	31×10^3 *2*			O	
	35.3×10^3 *5*			L	
	42.0×10^3			L	

† Based on γ-ray energies in ^{40}Sc ε decay; (p,γ); (γ,γ′) and (HI,xnγ). In other cases, a large number of excitation energies are from resonances in (p,p) and (p,α). When levels are known from particle-transfer reactions, weighted averages of available values are taken. The following reactions have imprecise excitation energies above ≈8 MeV, hence level correspondence between various reactions (as given in XREF column) is considered (by the evaluators) as tentative: resonances in (α,γ); (^{6}Li,d); (^{3}He,n); (d,d′), (^{3}He,^{3}He′); (α,α′); (HI,HI′) and (d,t).

‡ When no arguments are given, the assignments are based on Jπ′s determined in ^{39}K(p,γ) or in ^{39}K(p,p),(p,α):resonances. For high-spin structures (J>6), assignments are based on γ(θ) data and expected band associations. In particle-transfer reactions, target (^{39}K) Jπ=3/2+ for (d,n) and (^{3}He,d) reactions; target (^{41}Ca) Jπ=7/2- for (^{3}He,α) and (d,t) reactions. In arguments based on γ decays RUL (for E2 and M2 transitions) is also used when level lifetimes are known. For some of the high-energy levels populated only in (e,e′), Jπ assignments are from measurements of σ(θ) and deduced transition strengths in that reaction.

Lifetimes are mainly available from DSAM in (p,p′γ) (for 51 levels). For selected levels, values are also available from (γ,γ′) (for 17 levels); ^{39}K(p,γ) (for 6 levels); and (HI,xnγ) (for 3 levels).

γ(^{40}Ca)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ†	Iγ‡	Mult.§	δ§	Comments
3352.62	0+	0.0	0+	3352.6		E0		Decay is mainly by e^+e^- pair emission. ρ^2(E0)=0.026 *1* (1999Wo07).
3736.69	3-	0.0	0+	3736.3 *3*	100	E3		B(E3)(W.u.)=27 *4*.
3904.38	2+	3352.62	0+	551.8	0.081 *7*	[E2]		B(E2)(W.u.)=32 *4*.
		0.0	0+	3904.0 *1*	100	E2		B(E2)(W.u.)=2.26 *14*.
4491.43	5-	3736.69	3-	754.7 *2*	100	(E2(+M3))	+0.05 *3*	B(E2)(W.u.)=0.962 *17*.
5211.56	0+	3904.38	2+	1307.7 *3*	100	[E2]		B(E2)(W.u.)=17 *3*.
5248.79	2+	3904.38	2+	1344.4 *3*	18.9 *11*	M1+E2	+13 *+6-3*	B(E2)(W.u.)=22 *6*. B(M1)(W.u.)=$7.\times10^{-5}$ *7*.
		3352.62	0+	1896.1	6.4 *8*	(E2)		B(E2)(W.u.)=1.3 *4*.
		0.0	0+	5248.7 *5*	100.0 *15*	E2		B(E2)(W.u.)=0.13 *4*.
5278.80	4+	4491.43	5-	787.4	1.0 *8*	[E1]		B(E1)(W.u.)=$5.\times10^{-5}$ *5*.
		3904.38	2+	1374.1 *3*	100.0 *15*	(E2)		B(E2)(W.u.)=61 *10*.
5613.52	4-	4491.43	5-	1122.8 *2*	42.6 *25*	M1+E2	-0.7 *2*	B(E2)(W.u.)=5.7 *24*. B(M1)(W.u.)=0.0047 *12*.
		3736.69	3-	1876.7 *4*	100.0 *25*	M1+E2	-0.27 *5*	B(E2)(W.u.)=0.21 *8*. B(M1)(W.u.)=0.0033 *5*.
5629.41	2+	3352.62	0+	2277.5 *10*	14.0 *10*	[E2]		B(E2)(W.u.)=2.6 *7*.
		0.0	0+	5628.8 *2*	100.0 *10*	(E2)		B(E2)(W.u.)=0.20 *5*.
5902.63	1-	0.0	0+	5902.5 *2*	100	(E1)		B(E1)(W.u.)=0.00016 *3*.
6025.47	2-	3904.38	2+	2121.0 *6*	21 *3*	[E1]		B(E1)(W.u.)=7.0×10^{-5} *18*.
		3736.69	3-	2289.0 *3*	100 *3*	(M1+E2)		
6029.71	3+	5278.80	4+	751	3.5 *12*			γ from (p,p′γ) only.
		5248.79	2+	780.9	25 *4*	(E2(+M1))	>2	B(E2)(W.u.)=71 .

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_{γ}[†]	I_{γ}[‡]	Mult.[§]	δ[§]	Comments
								B(M1)(W.u.)=0.0057 .
		3904.38	2+	2124.4 *3*	100 *4*			
		3736.69	3-	2293.0	<8			
6285.15	3-	5613.52	4-	671.6	1.4 *3*			
		4491.43	5-	1793.2 *2*	100.0 *11*	(E2(+M3))	-0.03 *17*	B(E2)(W.u.)=7.9 *12*.
		3904.38	2+	2380.0 *5*	27.4 *7*	(E1)		B(E1)(W.u.)=2.5×10^{-5} *4*.
		3736.69	3-	2548.4	4.4 *6*			
		0.0	0+	6284.6	5.8 *7*	[E3]		B(E3)(W.u.)=4.1 *8*.
6422.4	(2+)	0.0	0+	6421.2 *9*	100	[E2]		B(E2)(W.u.)=0.71 *8*.
6507.87	4+	5278.80	4+	1229.0	4 *3*			
		5248.79	2+	1259.0	18 *4*	[E2]		B(E2)(W.u.)=26 *8*.
		3904.38	2+	2603.2 *3*	100 *4*	E2(+M3)	-0.09 *9*	B(E2)(W.u.)=3.8 *8*.
6542.80	4+	5629.41	2+	913.3	32 *3*	E2		B(E2)(W.u.)=1.7×10^{2} *4*. B(E2)(W.u.)>100 consistent with 6543, 4+ state as a member of SD band.
		5278.80	4+	1264.0	14 *4*			
		5248.79	2+	1294	24 *4*	(E2)		B(E2)(W.u.)=22 *6*.
		3904.38	2+	2638.1 *3*	100 *4*	E2(+M3)	-0.07 *7*	B(E2)(W.u.)=2.6 *6*.
6582.47	3-	5613.52	4-	969.0	25 *5*			
		4491.43	5-	2091.0	5 *3*	[E2]		B(E2)(W.u.)=0.33 *21*.
		3904.38	2+	2678.1	24.3 *17*	[E1]		B(E1)(W.u.)=2.8×10^{-5} *6*.
		3736.69	3-	2845.1 *3*	100.0 *20*	M1+E2	+3.1 *19*	B(E2)(W.u.)=1.3 *3*. B(M1)(W.u.)=0.0003 *3*.
6750.41	2-	3904.38	2+	2848.4 *10*	<10			I_{γ}: 22 *11* in (n,n′γ), 18 in (^{3}He,dγ).
		3736.69	3-	3014.0 *3*	100			
6908.70	2+	0.0	0+	6908.2 *1*	100	[E2]		B(E2)(W.u.)=1.88 *24*.
6930.2	6+	5278.80	4+	1652.4 *4*	100	E2		B(E2)(W.u.)=17 *+9−17*.
6931.29	3-	5629.41	2+	1301.8	7.0 *4*	[E1]		B(E1)(W.u.)=1.1×10^{-5} *5*.
		5613.52	4-	1317.7	2.4 *4*			
		5248.79	2+	1682.4	7.4 *4*	[E1]		B(E1)(W.u.)=5.3×10^{-6} *23*.
		4491.43	5-	2439.8	1.7 *4*	[E2]		B(E2)(W.u.)=0.008 *4*.
		3904.38	2+	3026.8	2.4 *6*	[E1]		B(E1)(W.u.)=3.0×10^{-7} *15*.
		3736.69	3-	3194.5	100.0 *9*			
6938.0	(1- to 5-)	3736.69	3-	3201	100			
6950.48	1-	0.0	0+	6949.9 *7*	100	[E1]		B(E1)(W.u.)=0.00181 *8*.
7113.1	1-	5629.41	2+	1484	5	[E1]		B(E1)(W.u.)=0.00010 . E_{γ}: (p,p′γ) only.
		5211.56	0+	1900	22	[E1]		B(E1)(W.u.)=0.00022 . E_{γ}: (p,p′γ) only.
		3904.38	2+	3208.5	28	[E1]		B(E1)(W.u.)=6.×10^{-5} . From (p,γ).
		0.0	0+	7113.3	100	[E1]		B(E1)(W.u.)=1.9×10^{-5} *10*. E_{γ}: from (p,γ).
7113.73	4-	6025.47	2-	1088.2	1.7 *5*	[E2]		B(E2)(W.u.)=7 *4*.
		5613.52	4-	1500.2	9.5 *6*			
		5278.80	4+	1834.9	2.6 *5*	[E1]		B(E1)(W.u.)=2.1×10^{-5} *10*.
		4491.43	5-	2623.2 *3*	39.8 *8*			
		3736.69	3-	3378.5 *3*	100.0 *10*			E_{γ}: poor fit. Level-energy difference=3377.0.
7239.07	(3-,4,5-)	5613.52	4-	1626	50			E_{γ}: (p,p′γ) only.
		4491.43	5-	2748	100			E_{γ}: (p,p′γ) only.
		3736.69	3-	3502.2	100			
7277.82	(2,3)+	3736.69	3-	3541.0	100	[E1]		B(E1)(W.u.)=0.00027 *19*.
7300.67	0+	5629.41	2+	1671.3	4.8 *16*	[E2]		B(E2)(W.u.)=2.1 *10*.
		5248.79	2+	2051.9	100.0 *16*	[E2]		B(E2)(W.u.)=15 *5*.

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
7397.2	(5+)	6029.71	3+	1369		(E2)		
		5278.80	4+	2120	100	(D)		
7421.9	(2+ to 6+)	3736.69	3-	3685	100			
7446.23	(3,4)+	5629.41	2+	1816.8	30.0 *16*			
		5613.52	4-	1831.5 *10*	48.5 *19*	[E1]		B(E1)(W.u.)=0.00014 *5*.
		5278.80	4+	2167.4	56 *3*			
		5248.79	2+	2197.4	100 *3*			
7466.35	2+	5248.79	2+	2217.5	24 *4*			
		3904.38	2+	3561.8	36 *3*			
		3352.62	0+	4113.5	21 *2*	[E2]		B(E2)(W.u.)=0.9 *5*.
		0.0	0+	7465.6	100 *4*	[E2]		B(E2)(W.u.)=0.22 *12*.
7481		0.0	0+	7480				
7532.26	2-	6285.15	3-	1247.1	23.1 *21*			
		6025.47	2-	1506.8	11.3 *9*			
		5902.63	1-	1629.6	8.0 *24*			
		5613.52	4-	1917.6 *10*	57 *3*	[E2]		B(E2)(W.u.)=4.1 *8*.
		3904.38	2+	3627.7	36 *3*	[E1]		B(E1)(W.u.)=1.16×10^{-5} *24*.
		3736.69	3-	3795.4	100 *4*			
7561.17	4+	6029.71	3+	1531.4	49 *5*			
		5248.79	2+	2312.3	100 *6*	[E2]		B(E2)(W.u.)=4.6 *14*.
		3736.69	3-	3824.3	15 *3*	[E1]		B(E1)(W.u.)=6.8×10^{-6} *24*.
7623.11	(2-,3,4+)	5629.41	2+	1993.6	100 *3*			
		5613.52	4-	2009.5	90 *3*			
		5248.79	2+	2374.2	31.5 *20*			
		3736.69	3-	3886.2	57.4 *20*			
7658.23	4-	6285.15	3-	1373.1	33 *5*			
		5613.52	4-	2045.8 *7*	100 *8*			
		4491.43	5-	3167.9 *7*	56 *8*			
		3736.69	3-	3920.0 *10*	67 *8*			
7676.6	(6+)	5278.80	4+	2397	100	(E2)		B(E2)(W.u.)=4.2 *10*.
7694.08	3-	5613.52	4-	2080.6	10.1 *13*			
		3736.69	3-	3957.5 *5*	100.0 *13*			
7701.8	0+	3904.38	2+	3797.2	100	[E2]		B(E2)(W.u.)=0.44 *11*.
7769.4	(3,4,5-)	5613.52	4-	2155.8	52 *9*			
		3736.69	3-	4032.5	100 *9*			
7814.7	0+	5248.79	2+	2566	43			
		3904.38	2+	3910	100			
7872.18	2+	0.0	0+	7871.9 *1*	100	[E2]		B(E2)(W.u.)=1.15 *12*.
7928.42	4+	5613.52	4-	2314.8	100 *18*	[E1]		B(E1)(W.u.)=0.0005 *4*.
		4491.43	5-	3436.8	100 *18*	[E1]		B(E1)(W.u.)=0.00014 *11*.
		3736.69	3-	4190	<14			I_γ: from (p,γ); 22 in (p,p′γ).
7974.4	(6+)	6542.80	4+	1432		(Q)		
		5278.80	4+	2695		(Q)		
7976.55	2+	5278.80	4+	2698	20	[E2]		B(E2)(W.u.)=2.3 *23*.
		3904.38	2+	4072	100			
		3352.62	0+	4624	60	[E2]		B(E2)(W.u.)=0.5 *5*.
		0.0	0+	7977	20	[E2]		B(E2)(W.u.)=0.010 *10*.
8018.8	0+	5248.79	2+	2770	100			
8091.61	2+	0.0	0+	8091.5 *2*	100	[E2]		B(E2)(W.u.)=0.67 *5*.
8098.9	8+	6930.2	6+	1168.7 *3*	100	E2		B(E2)(W.u.)=2.6 *4*.
8113.2	1(-)	0.0	0+	8111.9 *6*	100	[E1]		B(E1)(W.u.)=2.9×10^{-5} *13*.
8134.77	(2-,3,4+)	5629.41	2+	2505.3	82 *9*			
		5613.52	4-	2521.2	23 *9*			
		4491.43	5-	3643.1	<15			I_γ: from (p,γ); 100 in (p,p′γ).
		3904.38	2+	4230.1	100 *30*			
8187.5	(3,4,5-)	3736.69	3-	4450.7	100			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
8271	(≤ 3)-	6950.48	1-	1321	100			
		5902.63	1-	2368	67			
8276	0+	5629.41	2+	2647	100			
8323.16	(1-,2+)	6750.41	2-	1572.7	12.5 *10*			
		6285.15	3-	2038.0	2.2 *5*			
		6025.47	2-	2297.6	26.4 *17*			
		5902.63	1-	2420.5	1.9 *11*			
		5248.79	2+	3074.2	4.6 *8*			
		3736.69	3-	4586.2	100 *3*			
		0.0	0+	8322.2	3.4 *12*			Unobserved intensity=18 *3*.
8338.0	(2+ to 5-)	6542.80	4+	1795.2	100 *10*			
		6507.87	4+	1830.1	42 *10*			Unobserved intensity=25 *13*.
8358.9	(0,1,2)-			1405	100			
8364	(3- to 7-)	4491.43	5-	3872	100			
8373.94	4+	3904.38	2+	4469.3	100			
8424.81	2-	6025.47	2-	2399.3	19 *4*			
		5902.63	1-	2522.1	24 *4*			
		3736.69	3-	4687.8	100 *6*			
8439.0	0+	5629.41	2+	2809.5	100			
8484.02	0+	5902.63	1-	2581.3	58 *11*	[E1]		B(E1)(W.u.)=0.0005 *4*.
		3736.69	3-	4747.0	100 *11*	[E3]		B(E3)(W.u.)=6.$\times 10^3$ *4*. B(E3)(W.u.) exceeds RUL=100 by a factor of at least 20.
8540	(1,2+)	3352.62	0+	5187	67			
		0.0	0+	8540	100			
8551.1	5-	4491.43	5-	4060.8 *15*	100			
8578.80	2+	0.0	0+	8578.7 *2*	100	[E2]		B(E2)(W.u.)=0.31 *4*.
8587	(2+,3)	6025.47	2-	2562	25			
		5278.80	4+	3308	25			
		3904.38	2+	4683	17			
		3736.69	3-	4850	100			
8665.3	1-	0.0	0+	8665	100			
8678.29	4+	6285.15	3-	2393.1	20 *8*	[E1]		B(E1)(W.u.)=0.00018 *18*.
		3736.69	3-	4941.3	100 *23*	[E1]		B(E1)(W.u.)=0.00010 *10*. Unobserved intensity=34 *25*.
8701	(6-)	5613.52	4-	3088				
		4491.43	5-	4209				
8748.22	2+	0.0	0+	8749.4 *2*	100	[E2]		B(E2)(W.u.)=0.20 *4*.
8764.18	3-	6029.71	3+	2734.4	47 *18*			
		5629.41	2+	3134.6	56 *20*			
		5278.80	4+	3485.2	100 *30*			
		3904.38	2+	4859.5	65 *18*			Unobserved intensity ≈26.
8934.81	2+	7532.26	2-	1402.5	12.2 *11*			
		7277.82	(2,3)+	1657.0	3.5 *5*			
		7113.73	4-	1821.0	1.7 *4*			
		6950.48	1-	1984.3	5.6 *8*			
		6750.41	2-	2184.3	5.6 *8*			
		6582.47	3-	2352.2	1.9 *3*			
		6029.71	3+	2905.0	3.2 *10*			
		6025.47	2-	2909.2	17.5 *19*			
		5902.63	1-	3032.1	1.7 *5*			
		5629.41	2+	3305.2	2.9 *5*			
		5248.79	2+	3685.8	5.6 *24*			
		5211.56	0+	3722.9	3.5 *8*			
		3904.38	2+	5030.1	100 *5*			
		3736.69	3-	5197.8	2.9 *13*			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
		3352.62	0+	5581.8	21.8 *21*			
		0.0	0+	8933.7	77 *5*			
8935.8	(7+)	7397.2	(5+)	1538		(Q)		
		6930.2	6+	2004		(D)		
8982.5	2+	0.0	0+	8982.5 *5*	100	[E2]		B(E2)(W.u.)=0.143 *25*.
8994.50	(1-,2+)	7113.73	4-	1880.7	0.44 *24*			
		6908.70	2+	2085.7	0.62 *15*			
		6750.41	2-	2244.0	0.60 *8*			
		6582.47	3-	2411.9	0.44 *13*			
		6285.15	3-	2709.3	0.64 *16*			
		6025.47	2-	2968.9	1.5 *3*			
		5629.41	2+	3364.9	9.7 *7*			
		5211.56	0+	3782.6	8.2 *7*			
		3904.38	2+	5089.8	8.3 *8*			
		3736.69	3-	5257.4	2.4 *4*			
		3352.62	0+	5641.5	2.1 *5*			
		0.0	0+	8993.4	100.0 *21*			
9031.9	4-	7694.08	3-	1337.7	25 *8*			
		6285.15	3-	2746.6	25 *8*			
		5613.52	4-	3418.2	100 *13*			
		5278.80	4+	3752.9	30 *13*			
		4491.43	5-	4540.2	70 *13*			
9033	(7-)	4491.43	5-	4542				E_γ: this γ may correspond to 4540.2γ from 9031.9 level.
9091.70	3-	7694.08	3-	1397.5	3.7 *3*			
		7623.11	(2-,3,4+)	1468.6	1.31 *15*			
		7466.35	2+	1625.3	0.71 *5*			
		7277.82	(2,3)+	1813.8	2.17 *24*			
		7239.07	(3-,4,5-)	1852.6	1.26 *17*			
		7113.73	4-	1977.9	0.95 *15*			
		6750.41	2-	2341.2	0.98 *24*			
		6582.47	3-	2509.1	1.79 *24*			
		6285.15	3-	2806.4	8.8 *5*			
		6029.71	3+	3061.9	4.3 *7*			
		6025.47	2-	3066.1	5.0 *9*			
		5902.63	1-	3188.9	2.6 *3*			
		5278.80	4+	3812.7	14.6 *7*			
		5248.79	2+	3842.7	7.7 *3*			
		3904.38	2+	5187.0	16.2 *7*			
		3736.69	3-	5354.6	100.0 *17*			
9135.66	(3)-	8424.81	2-	710.8	1.72 *15*			
		7872.18	2+	1263.5	0.55 *9*			
		7694.08	3-	1441.5	8.9 *3*			
		7532.26	2-	1603.4	6.3 *3*			
		7277.82	(2,3)+	1857.8	0.43 *7*			
		7113.73	4-	2021.9	3.13 *20*			
		6950.48	1-	2185.1	0.78 *14*			
		6750.41	2-	2385.2	1.06 *15*			
		6582.47	3-	2553.0	3.5 *3*			
		6285.15	3-	2850.4	23.5 *7*			
		6025.47	2-	3110.1	0.43 *17*			
		5902.63	1-	3232.9	5.1 *3*			
		5613.52	4-	3522.0	0.51 *17*			
		5248.79	2+	3886.7	0.8 *3*			
		3904.38	2+	5230.9	13.6 *7*			
		3736.69	3-	5398.6	100.0 *15*			
9209.77	(1,2,3)-	8484.02	0+	725.7	1.53 *16*			
		8424.81	2-	785.0	5.4 *3*			

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ†	I_γ‡	Mult.§	δ§	Comments
		7694.08	3-	1515.6	7.3 *3*			
		7113.73	4-	2096.0	2.6 *2*			
		6950.48	1-	2259.2	4.5 *3*			
		6750.41	2-	2459.3	3.2 *3*			
		6582.47	3-	2627.1	3.6 *3*			
		6285.15	3-	2924.5	6.5 *3*			
		6025.47	2-	3184.2	2.6 *3*			
		5902.63	1-	3307.0	17.4 *5*			
		5629.41	2+	3580.2	3.4 *3*			
		3904.38	2+	5305.0	4.7 *5*			
		3736.69	3-	5472.7	100.0 *16*			
9226.69	(1-,2,3-)	7532.26	2-	1694.4	100 *5*			
		6950.48	1-	2276.1	15.9 *14*			
		6750.41	2-	2476.2	24.0 *15*			
		6285.15	3-	2941.4	27.8 *15*			
		5902.63	1-	3323.9	<2.2			
		5248.79	2+	3977.7	<12			
		3904.38	2+	5321.9	<2.3			
		3736.69	3-	5489.6	39 *3*			
		0.0	0+	9225.6	<89			
9227.43	(1,2+)	6025.47	2-	3201.8	35.0 *13*			
		5902.63	1-	3324.7	<0.8			
		5248.79	2+	3978.4	<4.2			
		3904.38	2+	5322.7	<0.8			
		3352.62	0+	5874.4	100 *3*			
		0.0	0+	9226.3	<30			
9305.2	(8+)	7676.6	(6+)	1628		(Q)		
		6930.2	6+	2375		(Q)		
9362.54	3-	8424.81	2-	937.7	4.3 *7*			
		7694.08	3-	1668.4	100.0 *24*			
		7658.23	4-	1704.3	26.6 *20*			
		7623.11	(2-,3,4+)	1739.4	3.5			
		6950.48	1-	2412.0	2.8			
		6750.41	2-	2612.0	3.3			
		6582.47	3-	2779.9	6.3 *7*			
		6285.15	3-	3077.3	9.5 *24*			
		5613.52	4-	3748.8	29.8 *22*			
		5248.79	2+	4113.5	10.7 *20*			
		3904.38	2+	5457.8	14.4 *20*			
		3736.69	3-	5625.4	8.3 *15*			
9388.20	2+	7694.08	3-	1694.0	7.3			
		7300.67	0+	2087.4	2.5			
		6542.80	4+	2845.3	28			
		6507.87	4+	2880.3	9.0			
		6285.15	3-	3102.9	3.3			
		6025.47	2-	3362.6	6.3			
		5629.41	2+	3758.6	19			
		5278.80	4+	4109.2	15			
		5248.79	2+	4139.2	7.8			
		5211.56	0+	4176.3	28			
		3904.38	2+	5483.4	8.5			
		3736.69	3-	5651.1	17			
		0.0	0+	9387.0	100			
9404.85	2-	7532.26	2-	1872.5	43			
		7277.82	(2,3)+	2127.0	2.2			
		7113.73	4-	2291.1	20			
		6950.48	1-	2454.3	4.1			
		6908.70	2+	2496.1	7.8			
		6582.47	3-	2822.2	10			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ †	I_γ ‡	Mult.§	δ§	Comments
		6285.15	3-	3119.6	100			
		5902.63	1-	3502.1	20			
		3904.38	2+	5500.1	7.3			
		3736.69	3-	5667.7	49			
		0.0	0+	9403.7	7.0			
9418.8	3-	7694.08	3-	1724.6	10			
		7658.23	4-	1760.5	6.7			
		7623.11	(2-,3,4+)	1795.6	4.0			
		7532.26	2-	1886.5	4.8			
		7113.73	4-	2305.0	62			
		6750.41	2-	2668.3	6.2			
		6285.15	3-	3133.5	100			
		6025.47	2-	3393.2	5.5			
		5902.63	1-	3516.0	12			
		5613.52	4-	3805.1	4.8			
		5248.79	2+	4169.8	4.3			
		3736.69	3-	5681.7	18			
9429.11	(3,4)-	7694.08	3-	1734.9	21 *3*			
		7658.23	4-	1770.8	100 *6*			
		7623.11	(2-,3,4+)	1806.0	3.3 *11*			
		7113.73	4-	2315.3	3.6 *8*			
		6582.47	3-	2846.5	26 *4*			
		6285.15	3-	3143.8	9.4 *17*			
		4491.43	5-	4937.3	81 *6*			
		3736.69	3-	5692.0	33 *6*			
9432.46	1-	7532.26	2-	1900.2	2.5			
		6950.48	1-	2481.9	0.8			
		6750.41	2-	2681.9	1.0			
		6025.47	2-	3406.8	2.3			
		3904.38	2+	5527.7	1.1			
		0.0	0+	9431.3	100			
9453.95	3-	8424.81	2-	1029.1	4.9 *6*			
		7694.08	3-	1759.8	73.2 *23*			
		7658.23	4-	1795.7	23.4 *20*			
		7623.11	(2-,3,4+)	1830.8	5.9 *3*			
		7532.26	2-	1921.6	3.3 *7*			
		7446.23	(3,4)+	2007.7	2.3 *7*			
		7113.73	4-	2340.2	34.7 *17*			
		6750.41	2-	2703.4	6.9 *7*			
		6285.15	3-	3168.7	100.0 *23*			
		6025.47	2-	3428.3	5.9 *10*			
		5629.41	2+	3824.3	8.3 *10*			
		5613.52	4-	3840.2	33.7 *20*			
		5278.80	4+	4174.9	5.7			
		3904.38	2+	5549.2	16.2 *20*			
		3736.69	3-	5716.8	11.2 *13*			
9603.0	3-	7113.73	4-	2489.2	61			
		6285.15	3-	3317.7	100			
		3736.69	3-	5865.8	24			
9604.6	1-	7532.26	2-	2072.3	5.8			
		6950.48	1-	2654.0	1.3			
		6750.41	2-	2854.1	2.0			
		6025.47	2-	3579.0	4.8			
		3904.38	2+	5699.8	1.0			
		3352.62	0+	6251.4	1.4			
		0.0	0+	9603.4	100			
9640.89	2-	7466.35	2+	2174.5	16.7 *6*			
		6950.48	1-	2690.3	0.32 *6*			
		6908.70	2+	2732.1	1.05 *10*			

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
		6285.15	3-	3355.6	0.99 *23*			
		5629.41	2+	4011.2	9.94 *21*			
		3904.38	2+	5736.1	100.0 *11*			
		3736.69	3-	5903.7	82.4 *11*			
		0.0	0+	9639.6	3.1			
9668.71	3-	7694.08	3-	1974.5	1.5 *3*			
		7532.26	2-	2136.4	4.1 *3*			
		7446.23	(3,4)+	2222.4	1.53 *25*			
		7113.73	4-	2554.9	60.6 *16*			
		6908.70	2+	2759.9	1.5 *3*			
		6750.41	2-	2918.2	4.6 *4*			
		6285.15	3-	3383.4	100.0 *14*			
		6025.47	2-	3643.1	6.8 *7*			
		4491.43	5-	5176.9	6.8 *2*			
		3904.38	2+	5763.9	8.1 *5*			
		3736.69	3-	5931.6	29.7 *14*			
9779.47	3	8748.22	2+	1031.3	17.1 *15*			
		8678.29	4+	1101.2	16.6 *20*			
		8578.80	2+	1200.7	25.1 *15*			
		8134.77	(2-,3,4+)	1644.7	13.6 *10*			
		7928.42	4+	1851.0	26.6 *15*			
		7872.18	2+	1907.3	28.6 *25*			
		7561.17	4+	2218.2	95 *4*			
		7466.35	2+	2313.1	14			
		6908.70	2+	2870.7	21.1 *25*			
		6582.47	3-	3196.8	7.5 *20*			
		6542.80	4+	3236.6	6.5 *15*			
		6507.87	4+	3271.5	3.5 *10*			
		6029.71	3+	3749.6	5.2			
		5629.41	2+	4149.8	10.0 *10*			
		5613.52	4-	4165.7	100 *4*			
		5278.80	4+	4500.4	27.1 *20*			
		5248.79	2+	4530.4	3.5 *10*			
		3904.38	2+	5874.7	73 *5*			
		3736.69	3-	6042.3	27 *3*			
9785.3	(1,2+)	7300.67	0+	2484.5	2.6			
		6908.70	2+	2876.5	0.8			
		3904.38	2+	5880.5	2.9			
		3352.62	0+	6432.1	11			
		0.0	0+	9784.0	100			
9853.5	(8+)	7974.4	(6+)	1880		(Q)		
		7676.6	(6+)	2176		(Q)		
		6930.2	6+	2921		(Q)		
9865.15	1	8439.0	0+	1426.1	0.25 *7*			
		8091.61	2+	1773.5	1.02 *11*			
		7872.18	2+	1992.9	0.29 *4*			
		7701.8	0+	2163.3	0.74 *25*			
		7466.35	2+	2398.7	0.57 *8*			
		7300.67	0+	2564.3	4.5 *3*			
		7277.82	(2,3)+	2587.2	0.28 *10*			
		6950.48	1-	2914.6	0.45 *6*			
		6908.70	2+	2956.3	1.54 *14*			
		6750.41	2-	3114.6	0.29 *3*			
		5902.63	1-	3962.3	0.49 *6*			
		5629.41	2+	4235.5	0.57 *10*			
		5248.79	2+	4616.1	0.35 *4*			
		5211.56	0+	4653.2	0.5			
		3904.38	2+	5960.3	7.1 *3*			
		3352.62	0+	6512.0	21.0 *7*			

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
		0.0	0+	9863.8 *20*	100.0 *17*			
9869.3	1+	7701.8	0+	2167.4	1.1			
		7300.67	0+	2568.5	3.0			
		6908.70	2+	2960.5	1.2			
		5248.79	2+	4620.2	1.1			
		5211.56	0+	4657.3	0.8			
		3904.38	2+	5964.4	7.4			
		3352.62	0+	6516.1	17			
		0.0	0+	9868.0	100			
9954.00	4+	8373.94	4+	1580.0	6.5 *5*			
		6931.29	3-	3022.6	5.2 *5*			
		6582.47	3-	3371.3	2.1 *5*			
		6542.80	4+	3411.1	18.2 *10*			
		6507.87	4+	3446.0	7.2 *3*			
		5613.52	4-	4340.2	8.2 *7*			
		5278.80	4+	4674.9	100 *3*			
		4491.43	5-	5462.2	4.6 *7*			
		3736.69	3-	6216.8	11.1 *10*			
10040.54	(2-,3-)	8764.18	3-	1276.3	10.4 *14*			
		8484.02	0+	1556.5	3.5 *6*			
		8323.16	(1-,2+)	1717.3	100 *2*			
		7623.11	(2-,3,4+)	2417.4	4.4 *6*			
		7532.26	2-	2508.2	1.8 *3*			
		7277.82	(2,3)+	2762.6	16.1 *6*			
		7113.73	4-	2926.7	8.5 *6*			
		6950.48	1-	3089.9	12.8 *12*			
		6582.47	3-	3457.8	2.7 *4*			
		6025.47	2-	4014.9	3.9 *4*			
		5902.63	1-	4137.7	26.3 *12*			
		3736.69	3-	6303.3	3.9 *4*			
10049.38	4-	9031.9	4-	1017.5	26.3 *11*			
		8187.5	(3,4,5-)	1861.6	1.17 *11*			
		7769.4	(3,4,5-)	2279.9	5.4 *3*			
		7239.07	(3-,4,5-)	2810.2	1.7 *3*			
		7113.73	4-	2935.5	32.0 *9*			
		6582.47	3-	3466.7	16.7 *7*			
		6285.15	3-	3764.0	2.88 *21*			
		6025.47	2-	4023.7	2.97 *23*			
		5613.52	4-	4435.6	2.17 *21*			
		4491.43	5-	5557.5	37.3 *9*			
		3736.69	3-	6312.2	100.0 *21*			
10262.53	3-	7623.11	(2-,3,4+)	2639.3	3.9 *6*			
		7466.35	2+	2796.1	43.3 *25*			
		7446.23	(3,4)+	2816.2	13.1 *11*			
		7113.73	4-	3148.7	3.9 *8*			
		6582.47	3-	3679.8	11.4 *8*			
		6029.71	3+	4232.6	45 *4*			
		5902.63	1-	4359.7	7.5 *11*			
		5629.41	2+	4632.8	8.1 *11*			
		5248.79	2+	5013.4	10.0 *11*			
		3904.38	2+	6357.6	100 *3*			
		3736.69	3-	6525.3	32 *3*			
10318.8	1+	7701.8	0+	2616.9	0.86 *8*			
		6950.48	1-	3368.2	0.50 *8*			
		5629.41	2+	4689.1	0.33 *8*			
		5211.56	0+	5106.8	0.93 *7*			
		3904.38	2+	6413.9	4.1 *2*			
		3352.62	0+	6965.5	14.4 *5*			
		0.0	0+	10317.4	100.0 *8*	D		

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
10415.06	3	7694.08	3-	2720.8	2.3 *11*			
		7623.11	(2-,3,4+)	2791.8	96 *3*			
		7561.17	4+	2853.8	6.5 *6*			
		7466.35	2+	2948.6	33.9 *12*			
		7446.23	(3,4)+	2968.7	100.0 *23*			
		7277.82	(2,3)+	3137.1	5.1 *8*			
		7113.73	4-	3301.2	9.02 *11*			
		6931.29	3-	3483.6	23.0 *12*			
		6908.70	2+	3506.2	90.2 *23*			
		6750.41	2-	3664.5	14.3 *6*			
		6582.47	3-	3832.3	7.7 *8*			
		6507.87	4+	3907.0	5.9 *9*			
		6285.15	3-	4129.7	2.1 *5*			
		6025.47	2-	4389.3	33.9 *17*			
		5629.41	2+	4785.3	4.7 *3*			
		5613.52	4-	4801.2	39.6 *17*			
		5278.80	4+	5135.9	15.5 *11*			
		5248.79	2+	5165.9	9.7 *10*			
		3904.38	2+	6510.1	20.1 *17*			
		3736.69	3-	6677.8	40.8 *23*			
10474		8701	(6-)	1773				
10639.07	(3-,4,5-)	8134.77	(2-,3,4+)	2504.2	3.1 *5*			
		7113.73	4-	3525.2	9.5 *7*			
		6931.29	3-	3707.6	100 *3*			
		6582.47	3-	4056.3	3.8 *5*			
		6542.80	4+	4096.1	6.9 *2*			
		6507.87	4+	4131.0	9.5 *5*			
		5613.52	4-	5025.2	32.3 *14*			
		5278.80	4+	5359.9	10.5 *10*			
		4491.43	5-	6147.1	8.6 *7*			
		3736.69	3-	6901.7	53.4 *24*			
10699.50	3	8373.94	4+	2325.5	2.0 *3*			
		8091.61	2+	2607.8	1.40 *18*			
		7532.26	2-	3167.1	2.0 *3*			
		7466.35	2+	3233.0	1.8 *4*			
		7446.23	(3,4)+	3253.1	1.8 *3*			
		6908.70	2+	3790.6	5.1 *4*			
		6542.80	4+	4156.5	3.9 *4*			
		6285.15	3-	4414.1	2.7 *4*			
		6029.71	3+	4669.5	7.4 *6*			
		5629.41	2+	5069.7	10.7 *6*			
		5613.52	4-	5085.6	3.9 *4*			
		5278.80	4+	5420.3	17.9 *10*			
		3904.38	2+	6794.5	100 *3*			
		3736.69	3-	6962.2	16 *3*			
10737.7	1-	7694.08	3-	3043.4	17 *3*			
		6908.70	2+	3828.8	7.8 *25*			
		6285.15	3-	4452.3	14.2 *24*			
		0.0	0+	10736.2	100 *5*			
10747.8	4+	5629.41	2+	5118.0	14.8 *11*			
		3904.38	2+	6842.8	100.0 *12*			
		3736.69	3-	7010.5	3.8 *7*			
10770.2	(1+)	7113.73	4-	3656.3	7.9 *17*			
		6908.70	2+	3861.3	14.3 *17*			
		5248.79	2+	5521.0	100 *5*			
		0.0	0+	10768.6	76 *5*			
10895	(9-)	9033	(7-)	1862		(Q)		
10910.0	(3,4,5)	3736.69	3-	7172.6	100			
10921.1	(2+,3,4+)	6025.47	2-	4895.3	20			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[§]	δ[§]	Comments
		5278.80	4+	5641.9	100			
10956.0	(3-,4+,5-)	8187.5	(3,4,5-)	2768.2	11			
		7481		3474.8	23			
		5902.63	1-	5053.0	23			
		5613.52	4-	5342.1	18			
		5278.80	4+	5676.8	100			
		3736.69	3-	7218.6	57			
10988.0	(3-,4+,5-)	8980	(5,6,7)+	2010	12			
		6908.70	2+	4079.1	12			
		6285.15	3-	4702.6	25			
		5629.41	2+	5358.2	25			
		3904.38	2+	7083.0	100			
		3736.69	3-	7250.6	88			
10994.7	(1-)	5278.80	4+	5715.5				
		5248.79	2+	5745.3				
		3736.69	3-	7257.3				
11003.0	(10+)	9305.2	(8+)	1698		(Q)		
		8098.9	8+	2902		(Q)		
11011.0	3-	8338.0	(2+ to 5-)	2672.9	27 *7*			
		7676.6	(6+)	3334.3	16 *4*			
		4491.43	5-	6519.0	100 *7*			
		3736.69	3-	7273.6	29			
		0.0	0+	11009.4	14			
11044.3	2+	3904.38	2+	7139.2				
		3736.69	3-	7306.9				
11070.6	(1- to 4+)	5613.52	4-	5456.1	7.7			
		5278.80	4+	5790.7	15			
		5248.79	2+	5820.7	15			
		3904.38	2+	7164.9	100			
		3736.69	3-	7332.6	15			
11078.2	1-	0.0	0+	11078				
11685.8	(10+)	9305.2	(8+)	2381		(Q)		
		8098.9	8+	3585		(Q)		
11708.7	(9+)	8935.8	(7+)	2773		(Q)		
11988	0+	10318.8	1+	1666.5 *4*[a]	75 *9*			
		9869.3	1+	2119.5 *4*	100 *9*			
12334.9	(10+)	9853.5	(8+)	2481		(Q)		
		9305.2	(8+)	3030		(Q)		
12591.9	(10+)	9305.2	(8+)	3287		(Q)		
		8098.9	8+	4491		(Q)		
12923	(11-)	10895	(9-)	2028				
13115.1	(12+)	11685.8	(10+)	1429		(Q)		
		11003.0	(10+)	2112		(Q)		
13194		3352.62	0+	9840				
		0.0	0+	13192				
13195	(10-)	10895	(9-)	2300				
13203		0.0	0+	13201				
13289		3352.62	0+	9935				
		0.0	0+	13287				
13535.5	(11+)	11708.7	(9+)	1827		(Q)		
13913	(4-)	3352.62	0+	10559				
		0.0	0+	13910				
13993		3352.62	0+	10639				
		0.0	0+	13990				
14232.4	(12+)	11685.8	(10+)	2547		(Q)		
		11003.0	(10+)	3229		(Q)		
15152.4	(13+)	13535.5	(11+)	1617		(Q)		
		13115.1	(12+)	2037		(D)		
15267.1	(12+)	12334.9	(10+)	2932		(Q)		

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

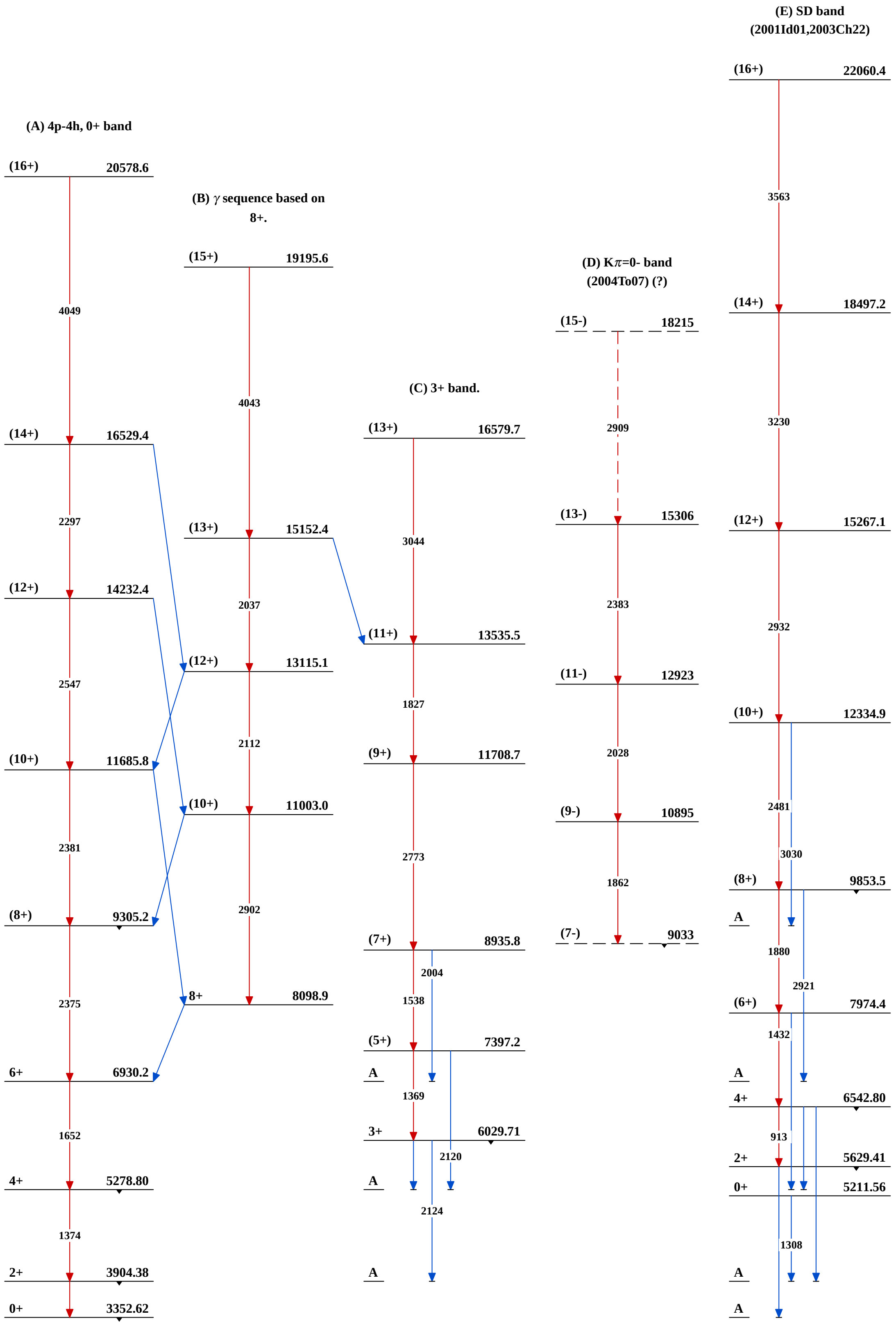
E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.[§]	δ[§]	Comments
15306	(13-)	12923	(11-)	2383				
15748.1	(12+)	12591.9	(10+)	3156		(Q)		
16529.4	(14+)	14232.4	(12+)	2297		(Q)		
		13115.1	(12+)	3414		(Q)		
16579.7	(13+)	13535.5	(11+)	3044		(Q)		
17698.6	(14+)	14232.4	(12+)	3466		(Q)		
18054.6	(14+)	14232.4	(12+)	3822		(Q)		
18215	(15-)	15306	(13-)	2909				
18497.2	(14+)	15267.1	(12+)	3230		(Q)		
18719.2	(14+)	15267.1	(12+)	3452		(Q)		
19195.6	(15+)	15152.4	(13+)	4043		(Q)		
20578.6	(16+)	16529.4	(14+)	4049		(Q)		
22060.4	(16+)	18497.2	(14+)	3563		(Q)		

[†] Values with uncertainties are averaged values from different γ-ray studies. A large number of values is from $^{39}K(p,\gamma)$, which are from level-energy differences since measured $E\gamma$'s were not available. In $^{39}K(p,\gamma)$, many γ rays are shown with upper limits on intensities, these are not given here. See $^{39}K(p,\gamma)$ for details.

[‡] Averaged values from different γ-ray studies, but most values are available only from $^{39}K(p,\gamma)$.

[§] From $\gamma(\theta)$ in (HI,xnγ) and (p,p$'\gamma$).

[a] Poor fit. Level-energy difference=1669.2.


(A) 4p-4h, 0+ band
(16+) 20578.6
4049
(14+) 16529.4
2297
(12+) 14232.4
2547
(10+) 11685.8
2381
(8+) 9305.2
2375
6+ 6930.2
1652
4+ 5278.80
1374
2+ 3904.38
0+ 3352.62
(B) γ sequence based on 8+.
(15+) 19195.6
4043
(13+) 15152.4
2037
(12+) 13115.1
2112
(10+) 11003.0
2902
8+ 8098.9
(C) 3+ band.
(13+) 16579.7
3044
(11+) 13535.5
1827
(9+) 11708.7
2773
(7+) 8935.8
2004
1538
(5+) 7397.2
A
1369
3+ 6029.71
2120
A
2124
A
(D) Kπ=0- band
(2004To07) (?)
(15-) 18215
2909
(13-) 15306
2383
(11-) 12923
2028
(9-) 10895
1862
(7-) 9033
(E) SD band
(2001Id01,2003Ch22)
(16+) 22060.4
3563
(14+) 18497.2
3230
(12+) 15267.1
2932
(10+) 12334.9
2481
3030
(8+) 9853.5
A
1880
2921
(6+) 7974.4
1432
A
4+ 6542.80
913
2+ 5629.41
0+ 5211.56
1308
A
A

^{40}K β^- decay (1.248×10^9 y) 1999BeZQ,1999BeZS

Parent: ^{40}K: E=0; Jπ=4-; $T_{1/2}$=1.248×10^9 y *3*; Q=1311.07 *11*; %β-=89.14 *13*

J: From unique 3rd forbidden β^- spectral shape for decay to 0+ level and L transfer in charge-particle reactions.

T: From 2004Ko09 and 2002Gr01; the same value from measurements of specific activity of natural potassium salts using liquid-scintillation counting (LSC) technique. (2002Gr01 reported a value of 1.248×10^9 y *2*, later adjusted to 1.248×10^9 y *3* by 2004Ko09 to correct the quoted uncertainty on measured isotopic abundance of ^{40}K). Both papers used natural abundance of ^{40}K as 0.01167% *2* (1975Ga24). The natural abundance of ^{40}K=0.0117% *1* (as recommended in the International Union of Pure and Applied Chemistry 70, 217 (1998), based on the measured value of 1975Ga24) would give about 4 times larger uncertainty on $T_{1/2}$. The earlier values of 1.265×10^9 y *13* (1999BeZS,1999BeZQ) based on recomputation of 1.277×10^9 y *8* (evaluation by 1973EnVA); and 1.26×10^9 y *1* (evaluation by 1990Ho28 from 14 different measurements out of a total of 34 measurements listed) are in good agreement. Variation of $T_{1/2}$ due to environmental conditions has been studied by 2001No10, where no significant effect has been reported. Earlier (pre-1977) measurements of partial (β^- and ce) and/or total $T_{1/2}$ of ^{40}K: 1977Ce04, 1972Go21, 1966Fe09, 1965Le15, 1965Br25, 1962Fl05, 1961Gl07, 1960Sa31, 1960Eg01, 1959Ke26, 1957We43, 1956Mc20, 1955Ba25, 1955Ko21, 1955Su38, 1953Bu58, 1950Sa52, 1947Gl07. Another 16 references (from 1931 to 1971) are listed by 1990Ho28 and in the 1978 Table of Isotopes (1978LeZA); but are not present in the NSR database.

Measurements: 2004Ko09, 2002Gr01, 2001No10, 1977Ce04, 1972Go21, 1967Mc10, 1966Fe09, 1965Le15, 1965Br25, 1962Fl05, 1962En01, 1961Gl07, 1960Sa31, 1960Eg01, 1959Ke26, 1957We43, 1956Mc20, 1955Ba25, 1955Ko21, 1955Su38, 1953Bu58, 1952Fe16, 1951Go29, 1951De34, 1950Sa52, 1949Ov01, 1948Ev09, 1947Gl07. This list is not complete, see 1978LeZA for several other references that are not present in NSR database.

The decay scheme, which includes the β^- decay to the ground state of ^{40}Ca and two levels in ^{40}Ar, is complete since these are the only levels in the daughter nuclides below the respective decay energies.

^{40}Ca Levels

E(level)	J$^\pi$	$T_{1/2}$
0	0+	STABLE

β^- radiations

Eβ^-	E(level)	Iβ^-	Log *ft*	Comments
(1311.07)	0	89.14 *13*	20.75	av Eβ=560.18 *5*. log*ft*: log $f^{3u}t$ from private communication from R. B. Firestone; see also 1970Wa11.

^{40}Sc ε decay (182.3 ms) 1982Ho09,1973De08

Parent: ^{40}Sc: E=0; Jπ=4-; $T_{1/2}$=182.3 ms *8*; Q=14323.0 *28*; %ε=100
1982Ho09: measured β^+ delayed protons, β^+ delayed α′s, $T_{1/2}$.
1973De08: measured Eγ, Iγ.
^{40}Sc decays to ^{36}Ar by εα (0.017% *5*) and to ^{39}K by εp (0.44% *7*) (1982Ho09).
Others:.
γ: 1971BlZH, 1968Ka08, 1966An01, 1965Ri06, 1955Gl22.
β^+: 1968Ar03, 1966An01.
$\beta^+\gamma$ coin: 1971BlZH.
εp: 1974Se11 (also 1973SeYM), 1969Ve04.
$T_{1/2}$(^{40}Sc): 1974Se11, 1973De08, 1972Mo08, 1969Ve04, 1968Ar03, 1966An01, 1962Sc08, 1955Gl22, 1954Ty33.

^{40}Ca Levels

E(level)†	Jπ#	E(p)(lab)	Comments
0	0+		
3735.8 *8*	3-		
4490.6 *10*	5-		
5613.1 *10*	4-		
6580 *4*	3-		
7658.3 *10*	4-		
9360 *3*	3-	1006 *3*	Eα=2089 *6*. Γ_α/Γ_p=0.0119 *5*. E(level): weighted average of 9360 *3* (from E(p)) and 9362 *6* (from Eα).
9416 *8*	3-	1060 *8*	
9427 *6*	(3,4)-	1071 *6*	
9452 *3*	3-	1095 *3*	
9601 *3*	3-	1241 *3*	
9811 *4*	(3,4,5-)	1445 *4*	
9829 *8*	(1- to 4+)	1463 *8*	E(level): probable doublet.
9920 *3*	(3,4,5-)	1552 *3*	
9952 *8*	4+		Eα=2620 *8*. $\Gamma_\alpha/\Gamma_p\geq$0.5.
9979 *5*	(3,4,5)	1609 *5*	
10050 *4*	4-	1678 *4*	
10127 *4*	(3-,4+)	1752 *4*	E(level): weighted average of 10126 *4* (from E(p)) and 10129 *8* (from Eα). Eα=2780 *8*. Γ_α/Γ_p=0.14 *5*.
10154 *8*	(3-,4+,5-)		Eα=2802 *8*. $\Gamma_\alpha/\Gamma_p\geq$2.
10193 *8*	(3-,4+,5-)		Eα=2837 *8*. $\Gamma_\alpha/\Gamma_p\geq$1.
10211 *4*	(3,4)-	1835 *4*	
10332 *4*	3-	1953 *4*	
10366 *8*	3-	1986 *8*	
10447 *4*	3-	2065 *4*	
10470 *4*‡	(3,5)-	2089 *4*	E(level): weighted average of 10471 *4* (from E(p)) and 10465 *7* (from Eα). Eα=3082 *7*. $\Gamma_\alpha/\Gamma_p\geq$1.
10504 *4*	(3,4,5)-	2121 *4*	
10519 *7*	(3-,4+,5-)		Eα=3132 *7*. $\Gamma_\alpha/\Gamma_p\geq$2.
10582 *5*	(3,4,5)	2197 *5*	
10598 *7*	3-	2211 *10*	E(level): weighted average of 10596 *10* (from E(p)) and 10599 *7* (from Eα). Eα=3203 *7*. Γ_α/Γ_p=2.0 *7*.
10693 *5*	3	2305 *5*	
10725 *5*	(3,5)-		Eα=3316 *5*. $\Gamma_\alpha/\Gamma_p\geq$30.
10754 *8*	(3,4,5)	2365 *8*	
10776 *5*	3-	2386 *5*	
10817 *7*‡	(3-,4+,5-)	2423 *9*	E(level): weighted average of 10814 *9* (from E(p)) and 10819 *7* (from Eα). Eα=3401 *7*. $\Gamma_\alpha/\Gamma_p\geq$0.5.
10849 *5*	(3,5)-	2457 *5*	
10909 *5*	(3,4,5)	2516 *5*	
10956 *8*	(3-,4+,5-)	2562 *8*	
10973 *7*	(3,4,5)	2578 *7*	
10987 *12*	(3-,4+,5-)		Eα=3552 *12*. $\Gamma_\alpha/\Gamma_p\geq$0.2.
11037 *7*	(3,4,5)	2641 *7*	
11088 *12*	(3-,4+)		Eα=3643 *12*. $\Gamma_\alpha/\Gamma_p\geq$0.5.

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^{40}Ca Levels (continued)

E(level)[†]	$J^{\pi\#}$	E(p)(lab)	Comments
11114 *6*		2716 *6*	E(level): probably a doublet.
11142 *6*	(3,4,5)-	2743 *6*	
11205 *5*	(3,5)-		Eα=3748 *5*. $\Gamma_\alpha/\Gamma_p \geq 6$.
11217 *5*	3-	2816 *5*	
11312 *5*[‡]	(3-,4+,5-)	2912 *5*	E(level): weighted average of 11315 *5* (from E(p)) and 11306 *7* (from Eα). Eα=3839 *7*. $\Gamma_\alpha/\Gamma_p \geq 1$.
11418 *7*	4+	3012 *7*	
11452 *9*		3045 *9*	E(level): probable doublet of natural-parity levels.
11472 *7*	(3-,4+,5-)		Eα=3988 *7*. $\Gamma_\alpha/\Gamma_p \geq 1$.
11549 *6*	(3,5)-		Eα=4058 *6*. $\Gamma_\alpha/\Gamma_p \geq 6$.
11616 *10*	(3,4,5)	3205 *10*	
11663 *7*	(3-,4+,5-)		Eα=4160 *7*. $\Gamma_\alpha/\Gamma_p \geq 2$.
11724 *4*[‡]	(3,5)-	3308 *10*	E(level): weighted average of 11723 *4* (from E(p)) and 11727 *7* (from Eα). Eα=4218 *7*. $\Gamma_\alpha/\Gamma_p \geq 0.2$.
11791 *10*	(3,4,5)	3376 *10*	
11841 *6*	(3-,4+,5-)		Eα=4320 *6*. $\Gamma_\alpha/\Gamma_p \geq 0.7$.
12001 *7*	(3,5)-	3584 *10*	Eα=4462 *7*. Γ_α/Γ_p=5 *2*.
12034 *10*	(3,4,5)-	3613 *10*	
12066 *9*	(3,5)-	3649 *10*	Eα=4519 *9*. Γ_α/Γ_p=1.3 *7*.

[†] S(p)(^{40}Ca)+E(p)(c.m.) for delayed proton decays; α-binding energy(^{40}Ca)+Eα(c.m.) for delayed α decays. S(p)(^{40}Ca)=8328.23 *9*, α-binding energy(^{40}Ca)=7039.65 *21* (2003Au03). All states above and including 9360 decay by protons to ^{39}K and/or α's to ^{36}Ar g.s.

[‡] Assumed here as the same level populated in εp and $\varepsilon\alpha$ decays, although 1982Ho09 treated these as separate levels populated in the two decays.

[#] From Adopted Levels.

γ(^{40}Ca)

E_γ[‡]	E_i^{level}	J_i^π	E_f^{level}	J_f^π	I_γ[†‡]	Mult.[§]	δ[§]
755.6 *8*	4490.6	5-	3735.8	3-	41 *4*		
1126 *3*	5613.1	4-			12 *2*	M1+E2	-0.7 *2*
1877.8 *7*	5613.1	4-	3735.8	3-	25.0 *15*	M1+E2	-0.27 *5*
2045.8 *7*	7658.3	4-	5613.1	4-	25.5 *15*		
2844 *3*	6580	3-	3735.8	3-	2.1 *10*	M1+E2	+3.1 *19*
3167.9 *7*	7658.3	4-	4490.6	5-	12 *2*		
3735.6 *8*	3735.8	3-	0	0+	100	E3	
3920.0 *10*	7658.3	4-	3735.8	3-	13 *2*		

[†] For absolute intensity per 100 decays, multiply by 0.9954 *10*.

[‡] From 1973De08.

[§] From adopted gammas.

ε,β^+ radiatons

Eε	E(level)	Iε	Log *ft*	$I(\varepsilon+\beta^+)$	Comments
(2257)	12066	2.2×10^{-5} *12*	5.6 *3*	0.00028 *15*	av Eβ=523 *5*. εK=0.0708 *17*. CL=0.00702 *17*. εM+=0.00118 *3*.
(2289)	12034	1.8×10^{-5} *7*	5.8 *2*	0.00024 *10*	av Eβ=537 *5*. εK=0.0657 *17*. CL=0.00652 *17*. εM+=0.00110 *3*.
(2322)	12001	4.1×10^{-5} *15*	5.4 *2*	0.00060 *22*	av Eβ=552 *4*. εK=0.0610 *12*.

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ε,β^+ radiatons (continued)

Eε	E(level)	Iε	Log *ft*	I(ε+β⁺)	Comments
					CL=0.00604 *12*. εM+=0.001016 *19*.
(2482)	11841	1.4×10^{-5} *5*	5.9 *2*	0.00028 *10*	av Eβ=624 *4*. εK=0.0433 *7*. CL=0.00429 *7*. εM+=0.000721 *11*.
(2532)	11791	1.1×10^{-5} *9*	6.0 *4*	0.00026 *20*	av Eβ=647 *5*. εK=0.0392 *9*. CL=0.00388 *9*. εM+=0.000652 *14*.
(2599)	11724	3.2×10^{-5} *12*	5.6 *2*	0.00082 *32*†	av Eβ=677 *4*. εK=0.0345 *6*. CL=0.00342 *6*. εM+=0.000574 *9*.
(2660)	11663	$8.\times10^{-6}$ *3*	6.2 *2*	0.00023 *10*	av Eβ=705 *4*. εK=0.0307 *5*. CL=0.00304 *5*. εM+=0.000511 *8*.
(2707)	11616	$8.\times10^{-6}$ *3*	6.3 *2*	0.00024 *10*	av Eβ=727 *5*. εK=0.0282 *6*. CL=0.00280 *6*. εM+=0.000470 *10*.
(2774)	11549	1.8×10^{-5} *6*	5.9 *2*	0.00066 *20*	av Eβ=757 *4*. εK=0.0251 *4*. CL=0.00249 *3*. εM+=0.000418 *6*.
(2851)	11472	8.9×10^{-6} *25*	6.2 *1*	0.00036 *10*	av Eβ=793 *4*. εK=0.0221 *3*. CL=0.00219 *3*. εM+=0.000368 *5*.
(2871)	11452	2.0×10^{-5} *5*	5.9 *1*	0.00083 *20*	av Eβ=802 *5*. εK=0.0214 *4*. CL=0.00212 *4*. εM+=0.000356 *6*. *I*(ε+β⁺): probably for a doublet.
(2905)	11418	$6.\times10^{-6}$ *5*	6.4 *4*	0.00028 *20*	av Eβ=818 *4*. εK=0.0202 *3*. CL=0.00200 *3*. εM+=0.000337 *5*.
(3011)	11312	1.4×10^{-5} *6*	6.1 *2*	0.00075 *30*†	av Eβ=868 *3*. εK=0.01712 *17*. CL=0.001696 *17*. εM+=0.000285 *3*.
(3106)	11217	0.00011 *2*	5.2 *1*	0.0068 *11*	av Eβ=911 *3*. εK=0.01493 *14*. CL=0.001479 *14*. εM+=0.00025 .
(3118)	11205	6.2×10^{-5} *13*	5.5 *1*	0.0038 *8*	av Eβ=917 *3*. εK=0.01468 *14*. CL=0.001454 *14*. εM+=0.00024 .
(3181)	11142	3.4×10^{-5} *6*	5.8 *1*	0.0023 *4*	av Eβ=946 *4*. εK=0.01343 *14*. CL=0.001330 *14*. εM+=0.00022 .
(3209)	11114	1.6×10^{-5} *4*	6.1 *1*	0.0011 *3*	av Eβ=959 *4*. εK=0.01292 *13*.

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ε,β^{+} radiatons (continued)

Eε	E(level)	Iε	Log *ft*	I(ε+β⁺)	Comments
					CL=0.001280 *13*. εM+=0.00022 . $I(\varepsilon+\beta^{+})$: probably for a doublet.
(3235)	11088	1.4×10^{-6} *14*	7.2 *5*	0.00010 *10*	av Eβ=971 *6*. εK=0.01247 *22*. CL=0.001235 *22*. εM+=0.000208 *4*.
(3286)	11037	$9.\times10^{-6}$ *3*	6.4 *2*	0.00069 *20*	av Eβ=995 *4*. εK=0.01165 *13*. CL=0.001154 *13*. εM+=0.00019 .
(3336)	10987	1.3×10^{-6} *12*	7.2 *4*	0.00011 *10*	av Eβ=1019 *6*. εK=0.01091 *18*. CL=0.001081 *18*. εM+=0.000182 *3*.
(3350)	10973	2.4×10^{-5} *5*	6.0 *1*	0.0020 *4*	av Eβ=1025 *4*. εK=0.01071 *12*. CL=0.001061 *11*. εM+=0.00018 .
(3367)	10956	2.3×10^{-5} *5*	6.0 *1*	0.0020 *4*	av Eβ=1033 *5*. εK=0.01048 *12*. CL=0.001038 *12*. εM+=0.00017 .
(3414)	10909	3.9×10^{-6} *22*	6.8 *3*	0.00035 *20*	av Eβ=1056 *3*. εK=0.00988 *8*. CL=0.000978 *8*. εM+=0.00016 .
(3474)	10849	3.9×10^{-5} *20*	5.8 *2*	0.0038 *20*	av Eβ=1083 *3*. εK=0.00917 *8*. CL=0.000908 *8*. εM+=0.00015 .
(3506)	10817	1.2×10^{-5} *3*	6.3 *1*	0.0012 *3*[†]	av Eβ=1098 *4*. εK=0.00882 *9*. CL=0.000873 *9*. εM+=0.00015 .
(3547)	10776	0.000120 *19*	5.3 *1*	0.0128 *20*	av Eβ=1118 *3*. εK=0.00840 *7*. CL=0.000832 *7*. εM+=0.00014 .
(3569)	10754	$8.\times10^{-6}$ *3*	6.5 *2*	0.0009 *3*	av Eβ=1128 *5*. εK=0.00818 *9*. CL=0.000810 *9*. εM+=0.00014 .
(3598)	10725	5.2×10^{-5} *11*	5.7 *1*	0.0059 *12*	av Eβ=1142 *3*. εK=0.00791 *6*. CL=0.000783 *6*. εM+=0.000132 .
(3630)	10693	$7.\times10^{-6}$ *3*	6.6 *2*	0.0008 *3*	av Eβ=1157 *3*. εK=0.00762 *6*. CL=0.000755 *6*. εM+=0.000127 .
(3725)	10598	7.9×10^{-6} *21*	6.5 *1*	0.00104 *28*	av Eβ=1202 *4*. εK=0.00685 *7*. CL=0.000678 *6*. εM+=0.00011 .
(3741)	10582	1.3×10^{-5} *3*	6.3 *1*	0.0017 *4*	av Eβ=1209 *3*. εK=0.00673 *5*.

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ε,β^+ radiatons (continued)

Eε	E(level)	Iε	Log *ft*	$I(\varepsilon+\beta^+)$	Comments
					CL=0.000667 *5*. εM+=0.0001120 *8*.
(3804)	10519	5.8×10^{-6} *14*	6.7 *1*	0.00083 *20*	av Eβ=1239 *4*. εK=0.00629 *6*. CL=0.000622 *6*. εM+=0.000105 .
(3819)	10504	8.6×10^{-5} *13*	5.5 *1*	0.0125 *19*	av Eβ=1246 *3*. εK=0.00619 *4*. CL=0.000613 *4*. εM+=0.0001029 *7*.
(3853)	10470	6.8×10^{-5} *9*	5.6 *1*	0.0102 *14*†	av Eβ=1262 *3*. εK=0.00597 *4*. CL=0.000591 *4*. εM+=9.94×10^{-5} *6*.
(3876)	10447	1.8×10^{-5} *3*	6.2 *1*	0.0028 *5*	av Eβ=1274 *3*. εK=0.00582 *4*. CL=0.000577 *4*. εM+=9.69×10^{-5} *6*.
(3957)	10366	1.8×10^{-6} *12*	7.2 *3*	0.00030 *20*	av Eβ=1312 *5*. εK=0.00536 *5*. CL=0.000530 *5*. εM+=8.91×10^{-5} *9*.
(3991)	10332	2.7×10^{-6} *12*	7.1 *2*	0.00046 *20*	av Eβ=1328 *3*. εK=0.00518 *3*. CL=0.000513 *3*. εM+=8.61×10^{-5} *5*.
(4112)	10211	7.1×10^{-5} *11*	5.7 *1*	0.0139 *22*	av Eβ=1386 *3*. εK=0.00460 *3*. CL=0.00045 . εM+=7.64×10^{-5} *5*.
(4130)	10193	1.1×10^{-6} *5*	7.5 *2*	0.00021 *10*	av Eβ=1395 *5*. εK=0.00452 *4*. CL=0.000447 *4*. εM+=7.51×10^{-5} *7*.
(4169)	10154	1.6×10^{-6} *5*	7.3 *2*	0.00032 *10*	av Eβ=1414 *5*. εK=0.00435 *4*. CL=0.000431 *4*. εM+=7.24×10^{-5} *7*.
(4196)	10127	7.1×10^{-6} *19*	6.7 *1*	0.0015 *4*	av Eβ=1427 *3*. εK=0.004238 *23*. CL=0.00042 . εM+=7.05×10^{-5} *4*.
(4273)	10050	1.9×10^{-5} *4*	6.3 *1*	0.0042 *9*	av Eβ=1463 *3*. εK=0.003949 *21*. CL=0.00039 . εM+=6.57×10^{-5} *4*.
(4344)	9979	$4.\times10^{-6}$ *2*	7.0 *3*	0.0009 *5*	av Eβ=1497 *3*. εK=0.003703 *22*. CL=0.00037 . εM+=6.16×10^{-5} *4*.
(4371)	9952	$6.\times10^{-7}$ *4*	7.8 *3*	0.00016 *10*	av Eβ=1510 *5*. εK=0.00362 *3*. CL=0.000358 *3*. εM+=6.01×10^{-5} *5*.
(4403)	9920	2.0×10^{-5} *4*	6.3 *1*	0.0050 *9*	av Eβ=1525.8 *24*. εK=0.003514 *16*.

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ε,β^+ radiatons (continued)

Eε	E(level)	Iε	Log *ft*	I(ε+β⁺)	Comments
					CL=0.00035 . εM+=5.84×10^{-5} *3*.
(4494)	9829	9.4×10^{-6} *25*	6.6 *1*	0.0026 *7*	av Eβ=1570 *5*. εK=0.00325 *3*. CL=0.00032 . εM+=5.40×10^{-5} *5*.
(4512)	9811	3.1×10^{-5} *5*	6.1 *1*	0.0088 *15*	$I(\varepsilon+\beta^+)$: probably for a doublet. av Eβ=1578 *3*. εK=0.003197 *16*. CL=0.00032 . εM+=5.32×10^{-5} *3*.
(4722)	9601	9.6×10^{-5} *15*	5.7 *1*	0.032 *5*	av Eβ=1679.4 *25*. εK=0.002687 *11*. CL=0.00027 . εM+=4.468×10^{-5} *18*.
(4871)	9452	0.00029 *5*	5.2 *1*	0.110 *17*	av Eβ=1751.4 *25*. εK=0.002389 *10*. CL=0.000236 . εM+=3.973×10^{-5} *16*.
(4896)	9427	0.00014 *3*	5.5 *1*	0.055 *10*	av Eβ=1764 *4*. εK=0.002344 *13*. CL=0.00023 . εM+=3.897×10^{-5} *22*.
(4907)	9416	0.00011 *2*	5.6 *1*	0.044 *8*	av Eβ=1769 *5*. εK=0.002324 *16*. CL=0.00023 . εM+=3.86×10^{-5} *3*.
(4963)	9360	0.00018 *3*	5.4 *1*	0.073 *11*	av Eβ=1795.9 *25*. εK=0.002227 *9*. CL=0.0002204 *9*. εM+=3.704×10^{-5} *14*.
6.75E3	7658.3	0.042 *3*	3.30 *4*	49.4 *40*	av Eβ=2625.8 *21*. εK=0.00077 . CL=7.594×10^{-5} *17*. εM+=1.276×10^{-5} *3*. Energy: E(β$^+$)=5730 *150* (1968Ar03) Iβ: 50 *1* (1968Ar03).
(7743)	6580	0.0011 *5*	5.0 *2*	2.1 *10*	av Eβ=3156 *3*. εK=0.00046 . CL=4.521×10^{-5} *12*. εM+=7.596×10^{-6} *19*.
8.55E3	5613.1	0.0039 *10*	4.6 *1*	11.5 *30*	av Eβ=3633.2 *21*. εK=0.0003068 *5*. CL=3.035×10^{-5} *5*. εM+=5.099×10^{-6} *9*. Energy: E(β$^+$)=7530 *200* (1968Ar03) Iβ: 15% *1* (1968Ar03).
9.78E3	4490.6	0.0039 *11*	4.7 *1*	17 *5*	av Eβ=4188.9 *21*. εK=0.0002048 *3*. CL=2.026×10^{-5} *3*. εM+=3.403×10^{-6} *5*. Energy: E(β$^+$)=8760 *100* (1968Ar03) Iβ: 15% *1* (1968Ar03).
10602	3735.8	0.0034 *9*	4.8 *1*	19 *5*	av Eβ=4563.2 *21*. εK=0.000160 . CL=1.59×10^{-5} . εM+=2.666×10^{-6} *4*.

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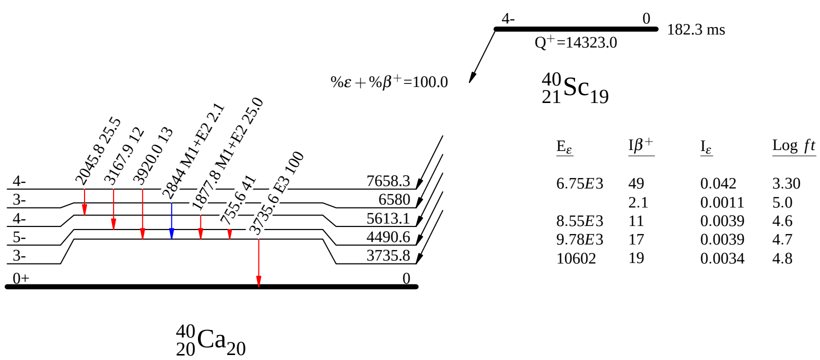
ε,β^+ radiatons (continued)

Eε	E(level)	Iε	Log *ft*	I(ε+β$^+$)	Comments
					Energy: E(β^+)=9580 *40* (1968Ar03). Iβ: 20% *1* (1968Ar03).

† Combined feeding from εp and εα decays, although 1982Ho09 treated the two levels as separate in the two decays.

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{41}Ti εp decay (80.4 ms) 1997Ho12,1998Li46,1998Bh12

Parent: ^{41}Ti: E=0; Jπ=3/2+; $T_{1/2}$=80.4 ms *9*; Q=11860 *SY*; %εp=100 *10*
Q(g.s.): 11860 *100* (syst,2003Au03).
^{41}Ti decays to ^{40}Ca by εp ($\approx$100%).
Other main references: 1985Zh05, 1974Se11 (also 1973SeYM), 1973Go06, 1966Po12, 1964Re08. Others ($T_{1/2}$): 1996Fa09, 1997Tr11.
Measured E(p), I(p), pγ coin, $T_{1/2}$.
Others: 1998Jo20, 1977Ce05, 1976Sz04, 1973Ha77.

^{40}Ca Levels

E(level)	Jπ[†]	Comments
0	0+	
3352.62 *9*	0+	
3736.69 *5*	3-	
3904	2+	E(level): from 1997Ho12.

[†] From Adopted Levels.

Delayed Particles (^{40}Ca)

E(^{40}Ca)	E(p)[‡]	E(^{41}Sc)[ϕ]	I(p)[†§]
3904	754 *12*	5774	0.29 *13*
0	986 *2*	2095	5.6 *9*
3736.69	1249 *15*[a]	6102	1.05 *19*
3904	1249 *15*[a]	6270	1.05 *19*
0	1542 *2*	2666	4.2 *13*
0	1587 *10*	2712	0.48 *23*
3904	1857 *28*	6893	0.8 *3*
3352.62	1977 *10*[a]	6465	0.56 *14*
3904	1977 *10*[a]	7021	0.56 *14*
3736.69	2063 *30*[b]	6938	1.1 *2*
0	2271 *3*	3413	5.0 *7*
0	2414 *3*	3560	3.4 *3*
0	2.54×10^3 *13*	3690	0.62 *12*
0	2656 *7*	3808	1.5 *3*
0	2804 *8*	3960	0.89 *20*
0	3083 *4*	4246	15.8 *5*
0	3152 *19*	4317	0.80 *13*
0	3343 *10*	4512	0.60 *7*
0	3483 *9*	4656	0.65 *7*
0	3600 *5*	4776	2.15 *25*
0	3691 *4*	4869	3.7 *5*
0	3749 *5*	4929	7.4 *5*
0	3832 *8*	5014	0.62 *5*
0	3890 *17*	5073	0.43 *8*
0	4187 *4*	5378	3.72 *12*
0	4307 *11*	5501	0.34 *10*
0	4385 *6*	5581	1.69 *12*
0	4570 *7*	5767	0.88 *13*
0	4638 *4*	5840	5.3 *4*
0	4683 *10*	5886	1.06 *16*
0	4735 *3*	5940	25.0 *10*
0	4829 *10*	6036	0.8 *3*
0	4876 *15*	6084	0.84 *9*
0	4944 *11*	6154	0.76 *13*
0	5157 *14*	6372	0.40 *11*
0	5219 *40*	6435	0.65 *12*
0	5337 *23*	6557	0.37 *20*
0	5441 *40*	6673	0.60 *12*

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Delayed Protons (continued)

E(^{40}Ca)	E(p)[‡]	E(^{41}Sc)[φ]	I(p)[†§]
0	5601 *15*	6827	0.065 *7*
0	5718 *14*	6947	0.094 *8*
0	5790 *27*	7021	0.56 *14*
0	5947 *19*	7182	0.102 *10*
0	6121 *19*	7360	0.072 *7*
0	6371 *38*	7617	0.050 *15*
0	6650 *50*	7903	0.050 *5*
0	6725 *60*	7980	0.07 *2*

† For absolute intensity per 100 decays, multiply by ≈ 1.0.

‡ E(p)(lab) values are from a weighted average of 1998Bh12, 1998Li46, 1997Ho12 and 1974Se11, except where noted.

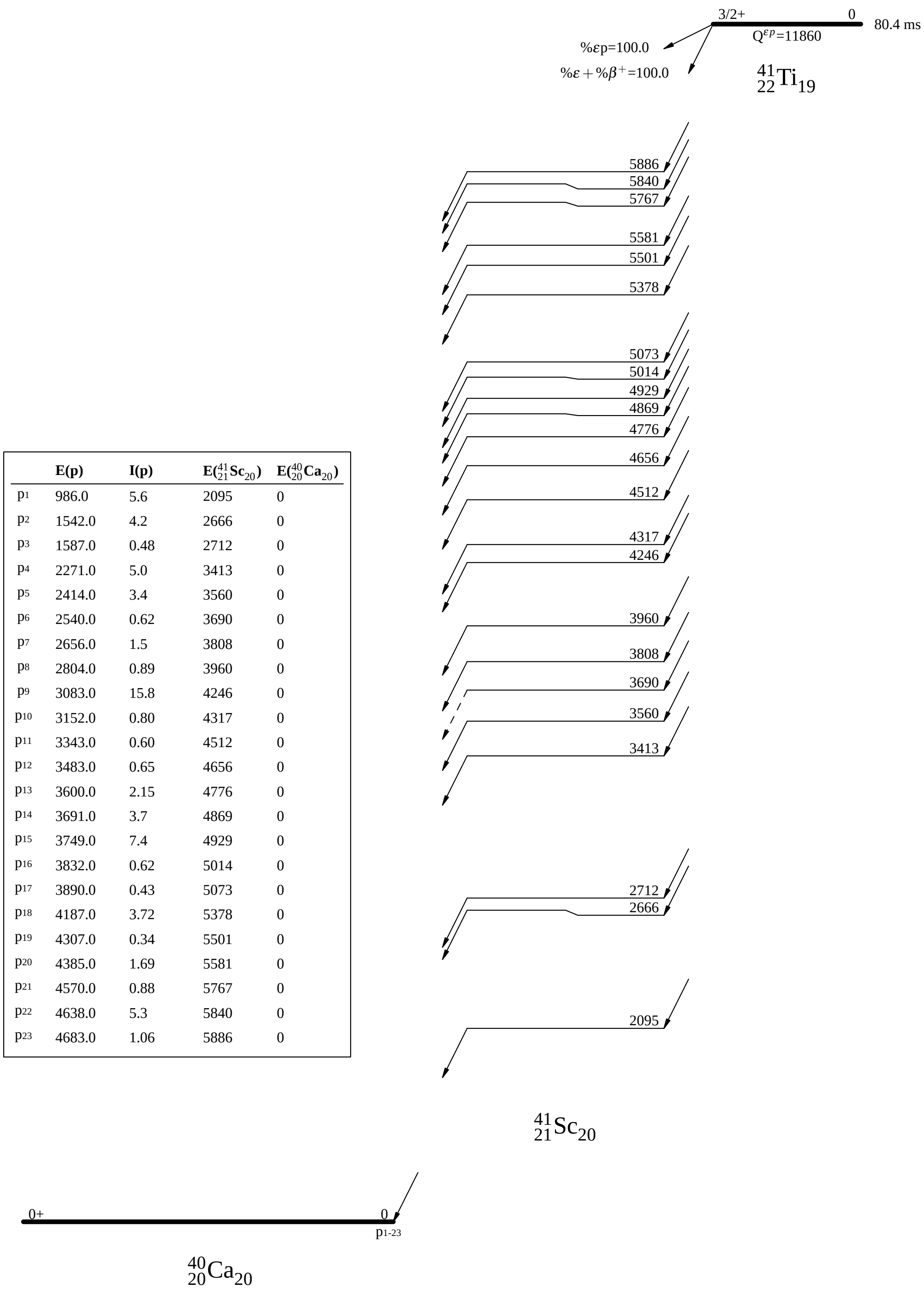
§ From weighted averages of 1998Li46, 1998Bh12, 1997Ho12, 1985Zh05, and 1974Se11.

φ From ^{41}Ti ε decay (80 ms)

a 1249 and 1977 proton groups are doubly placed.

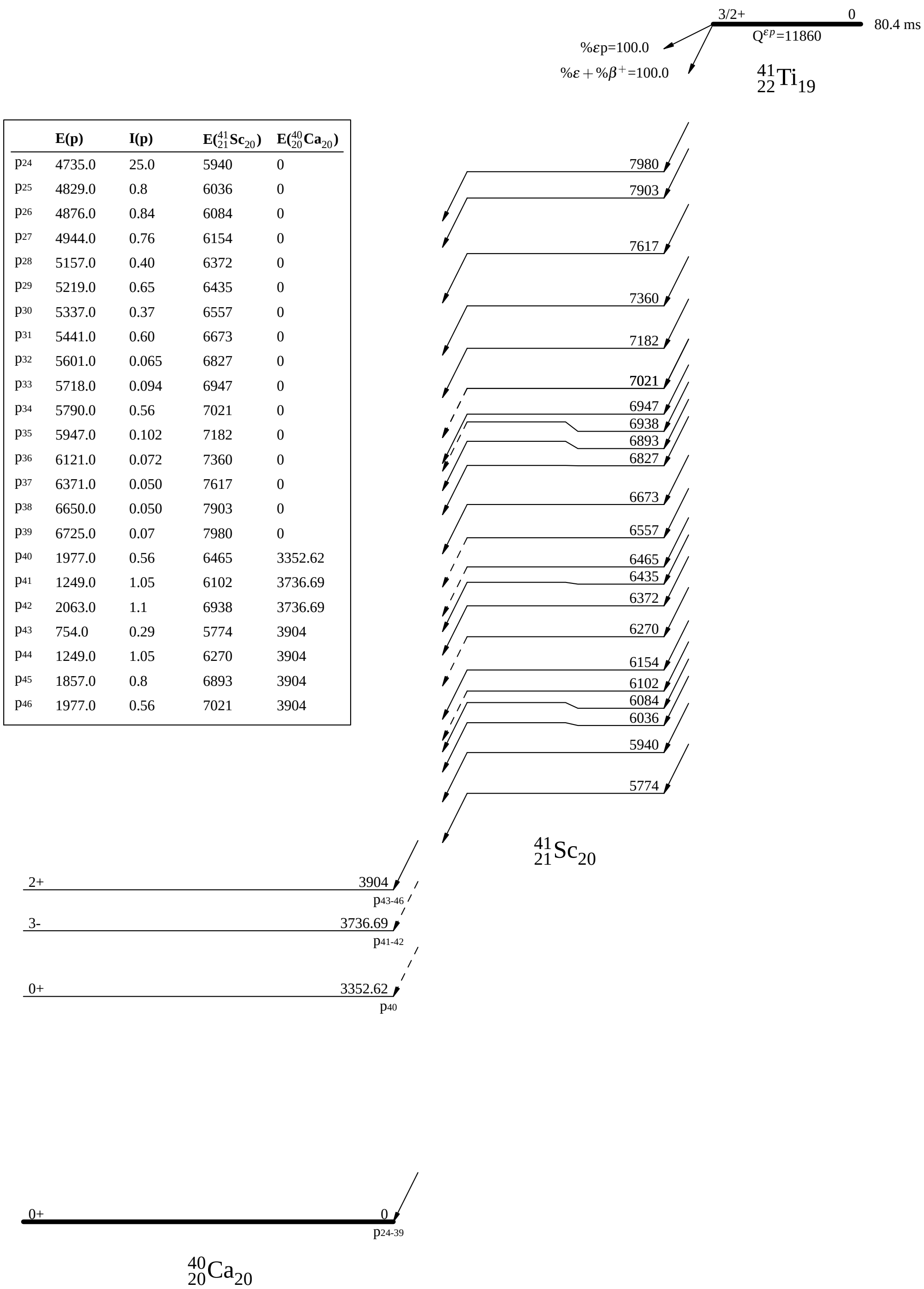
b This group is not reported by 1997Ho12.

Decay Scheme



	E(p)	I(p)	E($^{41}_{21}$Sc$_{20}$)	E($^{40}_{20}$Ca$_{20}$)
p1	986.0	5.6	2095	0
p2	1542.0	4.2	2666	0
p3	1587.0	0.48	2712	0
p4	2271.0	5.0	3413	0
p5	2414.0	3.4	3560	0
p6	2540.0	0.62	3690	0
p7	2656.0	1.5	3808	0
p8	2804.0	0.89	3960	0
p9	3083.0	15.8	4246	0
p10	3152.0	0.80	4317	0
p11	3343.0	0.60	4512	0
p12	3483.0	0.65	4656	0
p13	3600.0	2.15	4776	0
p14	3691.0	3.7	4869	0
p15	3749.0	7.4	4929	0
p16	3832.0	0.62	5014	0
p17	3890.0	0.43	5073	0
p18	4187.0	3.72	5378	0
p19	4307.0	0.34	5501	0
p20	4385.0	1.69	5581	0
p21	4570.0	0.88	5767	0
p22	4638.0	5.3	5840	0
p23	4683.0	1.06	5886	0

Decay Scheme (continued)



	E(p)	I(p)	E($^{41}_{21}Sc_{20}$)	E($^{40}_{20}Ca_{20}$)
p_{24}	4735.0	25.0	5940	0
p_{25}	4829.0	0.8	6036	0
p_{26}	4876.0	0.84	6084	0
p_{27}	4944.0	0.76	6154	0
p_{28}	5157.0	0.40	6372	0
p_{29}	5219.0	0.65	6435	0
p_{30}	5337.0	0.37	6557	0
p_{31}	5441.0	0.60	6673	0
p_{32}	5601.0	0.065	6827	0
p_{33}	5718.0	0.094	6947	0
p_{34}	5790.0	0.56	7021	0
p_{35}	5947.0	0.102	7182	0
p_{36}	6121.0	0.072	7360	0
p_{37}	6371.0	0.050	7617	0
p_{38}	6650.0	0.050	7903	0
p_{39}	6725.0	0.07	7980	0
p_{40}	1977.0	0.56	6465	3352.62
p_{41}	1249.0	1.05	6102	3736.69
p_{42}	2063.0	1.1	6938	3736.69
p_{43}	754.0	0.29	5774	3904
p_{44}	1249.0	1.05	6270	3904
p_{45}	1857.0	0.8	6893	3904
p_{46}	1977.0	0.56	7021	3904

^{44}V $\varepsilon\alpha$ decay (111 ms) 1971Ce02

Parent: ^{44}V: E=0; $T_{1/2}$=111 ms *7*; Q=8.30×10^{3} *12*;
T: Half-life from 1997Ha04. Other: 90 ms *25* (1971Ce02).

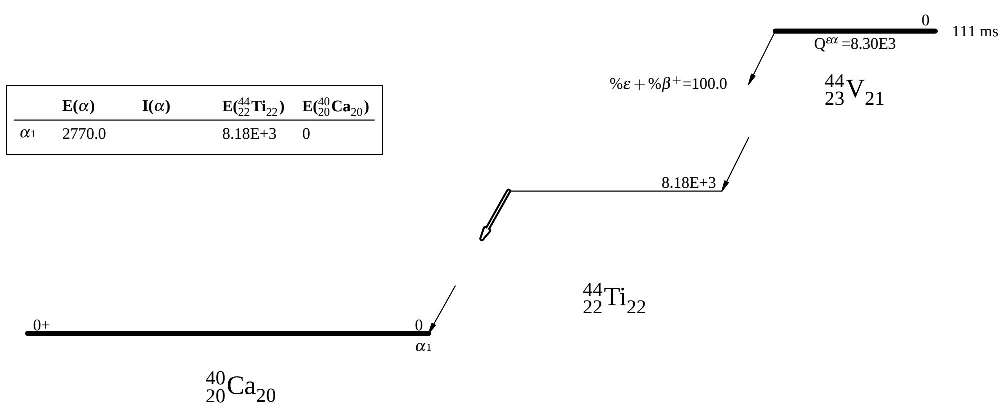
^{40}Ca Levels

E(level)	J$^{\pi}$
0	0+

Delayed Particles (^{40}Ca)

E(^{40}Ca)	E(α)	E(^{44}Ti)
0	2770 *20*	8.18E+3

Decay Scheme



Inelastic scattering

Includes elastic scattering: (HI,HI).
HI=^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, ^{11}B, ^{12}C, ^{13}C, ^{14}C, ^{14}N, ^{16}O, ^{17}O, ^{18}O, ^{20}Ne, ^{28}Si, ^{32}S, ^{37}Cl, ^{40}Ar, ^{40}Ca, ^{48}Ca, ^{86}Kr.
(^{6}Li,^{6}Li′):.
1982Co12: E=30 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=9° - 78°; DWBA double-folding model analysis, deduced deformation lengths. Levels at 0, 3740, 3900, 4490.
1977Bo21: E=30 MeV. Measured $\sigma(\theta)$, coupled-channel analysis, Hauser-Feshbach calculations.
1987Va31: E=34 MeV. Also ^{6}Li(^{40}Ca,^{40}Ca′) E=227 MeV. Measured $\sigma(\theta)$, DWBA analysis.
(^{6}Li,^{6}Li):.
1989Na02: E=210 MeV. Measured $\sigma(\theta)$.
1980An16: E=28, 32 MeV.
1981Fu04: E=88 MeV. DWBA and coupled-channel analysis.
1981Sc16: E=99 MeV. Measured $\sigma(\theta)$, optical-model analysis.
1977Cu02: E=28, 34 MeV. Deduced optical-model parameters; $\sigma(\theta)$.
1976Ch27: E=50.6 MeV. Measured $\sigma(\theta)$.
1971Da33: E=30 MeV. Measured $\sigma(\theta)$.
1969Be90: E=20 MeV. Measured $\sigma(\theta)$.
(^{7}Li,^{7}Li′):.
1985Sa25: E=34 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=10° - 135°; DWBA coupled-channel analysis. Levels at 3740, 3900, 4490, 6290.
1982Ec01: E=45 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=12° - 80°; double folding model.
(^{7}Li,^{7}Li):.
1980CuZZ, 1977Cu02: E=28, 34 MeV. Deduced optical-model parameters from $\sigma(\theta)$.
1969Be90: E=20 MeV. Measured $\sigma(\theta)$.
(^{9}Be,^{9}Be′):.
1980Ec04: E=45, 60 MeV. Measured $\sigma(\theta)$; DWBA analysis for 3-,5- levels; double folding model. Levels at 3730, 3900, 4490, 5900, 6400, 6940, 7300.
(^{9}Be,^{9}Be):.
1980Ec01: E=45, 60 MeV. Measured $\sigma(\theta)$.
1983Ec01: E=35-60 MeV. Measured $\sigma(\theta)$.
1984Fu10: E=158 MeV. Measured $\sigma(\theta)$.
1985Wi18: E=30, 45 MeV. Measured $\sigma(\theta)$.
(^{10}B,^{10}B):.
1983BoZU: E=31 MeV. Measured $\sigma(\theta)$.
1981GlZY, 1980Gl03: E=46.6 MeV. Measured $\sigma(\theta)$.
(^{11}B,^{11}B′):.
1981Hn01: E=51.5 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=10° - 60°; DWBA coupled-channel, double-folding model analysis. Levels at 3740, 3900, 4490. Deduced deformation lengths.
1981Hn04: E=40 MeV. Measured $\sigma(\theta)$, DWBA analysis; deduced deformation lengths.
(^{11}B,^{11}B):.
1983BoZU: E=32, 68 MeV. Measured $\sigma(\theta)$.
1981GlZY, 1980Gl03: E=51.5 MeV. Measured $\sigma(\theta)$.
1980Ma31: E=32 MeV. Measured $\sigma(\theta)$, DWBA analysis.
(^{12}C,^{12}C′):.
1981Bu08: E=1032 MeV. Measured $\sigma(\theta)$, θ=4° - 16°. Data for g.s.
(^{12,12}C):.
1986Sa29: E=10-35 MeV. Measured $\sigma(\theta)$.
1980Ku03, 1979Ku02: ^{12}C(^{40}Ca,^{40}Ca) E=18-40 MeV; 80-178 MeV. Measured $\sigma(\theta)$.
1978Re06, 1979Re03: E=135-150 MeV; 51 MeV. Measured σ at 180°. Optical-model analysis.
1976MoYU: E=45 MeV. Measured $\sigma(\theta)$.
1972Sc21: E=114 MeV.
(^{13}C,^{13}C′):.
1977Bo17: E=68 MeV. Measured $\sigma(\theta)$, θ=8° - 40°; CCBA analysis; levels at 3740, 3900, 4490. Deduced deformation lengths relative to those from (p,p′), normalized to 1.0 for 3900 level.
(^{14}C,^{14}C′):.
1981Ha23: E=51 MeV. Measured $\sigma(\theta)$; $\theta(\varepsilon M)$=13° - 53°; DWBA and CCBA analysis. Levels at 3740, 3900, 4480.
(^{14}N,^{14}N′):.
1978Bu10: E=161 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=12°. Levels at 6900 and 7900. Deduced giant resonances.
1975Wi02: (^{14}N,^{14}N) E=24-54 MeV. Measured $\sigma(\theta)$.
(^{16}O,^{16}O′):.
1982Re03, 1978Re02: E=60 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=10° - 65°; energy uncertainty ≈100 keV; DWBA fits with coupled channels analysis. Levels at 3740, 3900, 4490.
1981Al12: E=51.5, 54 MeV. Measured $\sigma(\theta)$.
1981Ku10: E=50-70 MeV. Measured $\sigma(\theta)$, coupled-channel analysis.

1973Be13: E=60 MeV. Measured $\sigma(\theta)$.
(^{16}O,^{16}O):.
1985Me14: E=1503 MeV.
1988Ro01: E=94 MeV. Measured $\sigma(\theta)$.
1979Vi13: E=40-214 MeV. Measured fusion σ.
1979Ku02: E=50 MeV. Also ^{16}O(^{40}Ca,^{40}Ca) E=80-178 MeV. Measured $\sigma(\theta)$.
1973Ch10: E=47, 49 MeV.
1972Gr25: E=25-45 MeV. Measured $\sigma(\theta)$.
1971Be26: E=20-40 MeV. Measured $\sigma(\theta)$.
1971Or02: E=36-48 MeV. Measured $\sigma(\theta)$.
1969Ec01: E=23-42 MeV. Measured $\sigma(\theta)$.
(^{17}O,^{17}O′):.
1989AlZQ: E=1428 MeV. Measured σ, $\theta(\varepsilon M)$=small. Energy uncertainty <400 keV. Levels at 3740, 3900, 4490.
(^{18}O,^{18}O′):.
1982Re14, 1982Re03: E=62.14 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=10° - 65°; DWBA fits with coupled channels in ^{40}Ca and ^{18}O. Levels at 3740, 3900, 4490. Deduced deformation lengths.
1972Ei07: (^{18}O,^{18}O) E=25-42 MeV. Measured $\sigma(\theta)$.
(^{20}Ne,^{20}Ne′):.
1978Ng01: E=36-95 MeV. Measured $\sigma(\theta)$; optical-model, DWBA, coupled-channel analysis.
1980Se06: (^{20}Ne,^{20}Ne) E=151 MeV. Measured $\sigma(\theta)$, optical-model parameters.
(^{28}Si,^{28}Si′):.
1986Vi02: E=225 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=4° - 30°; DWBA analysis; energy uncertainty ≈400 keV. Unresolved doublet: 3740+3900. Deduced deformation length.
(^{32}S,^{32}S′):.
1986Bi02: E=100, 120, 151.5 MeV. Measured $\sigma(\theta)$; folding model analysis for 3740 level.
1975Re17: E=100 MeV. Measured $\sigma(\theta)$ for θ=20° - 60°; DWBA analysis for 3900 level.
(^{32}S,^{32}S):.
1988Bi06: E=90, 100, 110, 120, 151.5 MeV. Measured $\sigma(\theta)$, folding-model analysis.
1984Ba27: E=100, 120, 151.5 MeV. Measured $\sigma(\theta)$; optical-model analysis.
1989Di06: E=90, 110 MeV. Measured $\sigma(\theta)$.
1977Ri03: E=58-130 MeV. Measured $\sigma(\theta)$.
(^{37}Cl,^{37}Cl′):.
1997Wi17: E=97.3, 115.3 MeV. Measured $\sigma(\theta)$.
1990Fe03: (^{37}Cl,^{37}Cl) E=120.5 MeV. Measured $\sigma(\theta)$; folding model and DWBA analysis.
(^{40}Ar,^{40}Ar′):.
1987Fr20: E=1760 MeV. Measured σ, θ(lab)=2.5°. Giant resonances at 8000 and 18000.
1978Wa18, 1979Wa06: (^{40}Ar,^{40}Ar) E=191, 236, 272 MeV. Measured $\sigma(\theta)$, optical-model parameters.
(^{40}Ca,^{40}Ca′):.
1982Bl04: E=160, 280, 400 MeV. Measured $\sigma(\theta)$, DWBA analysis; FWHM=1.5 MeV. Levels and giant resonances at 3740, 7800, 10700, 14000, 17600, 26000. See also 1981Ro01, 1980Fr02, 1979Tr10, 1977Fr14 from the same group where ^{40}Ca(^{40}Ca,X) reaction was studied at E(^{40}Ca)=284 and 400 MeV.
2004Sc07, 1993Sc29: E=50 MeV/nucleon. Measured (^{40}Ca)(p) coin; deduced two-phonon double GQR and multi-phonon giant resonance features.
(^{40}Ca,^{40}Ca):.
1977Do02: E=55-120 MeV. Measured $\sigma(\theta)$.
1977Ri03: E=58-130 MeV. Measured $\sigma(\theta)$.
1975Do07: (^{40}Ca,^{40}Ca) E=110-150, 170-200 MeV. Measured σ.
(^{48}Ca,^{48}Ca):.
1990Ti04: E=132, 140 MeV. Measured $\sigma(\theta)$, coupled-channel analysis.
(^{86}Kr,^{86}Kr′):.
1999Ot02: E=5160 MeV. Measured $\sigma(\theta)$, θ=1° - 6°; fitted elastic and inelastic channels from 13-25 MeV excitation. Energy uncertainty=1400 keV. Deduced E1 and E2 strength distributions.

^{40}Ca Levels

E(level)	$J^{\pi\dagger}$	L#	Comments
0	0+	0	
3740	3-	3	β_3R=0.49 (^{6}Li,1982Co12); 1.15 (^{11}B,1981Hn01); 1.29 *18* (^{28}Si,1986Vi02). β_3R(p,p′)/β_3R(^{13}C,^{13}C′)=1.3 (1977Bo17).
3900	2+	2	β_2R=1.04 (^{6}Li,1982Co12); 0.44 (^{11}B,1981Hn01); 1.37 *14* (^{28}Si,1986Vi02).
4490	5-	5	β_5R=0.53 (^{6}Li,1982Co12); 1.15 (^{11}B,1981Hn01). β_5R(p,p′)/β_5R(^{13}C,^{13}C′)=1.9 (1977Bo17).

Continued on next page (footnotes at end of table)

^{40}Ca Levels (continued)

E(level)	$J^{\pi\dagger}$	L[#]	Comments
5900			
6290			
6400			
6940			
7300			
7.8×10^3 *10*[‡]			Probably lower excitation of the octupole resonance.
10.7×10^3 *10*[‡]			
14.0×10^3 *10*[‡]			
17.6×10^3 *10*[‡]			GQR; wide structure.
26×10^3[‡]			E(level): wide structure.

† From Adopted Levels.
‡ Giant resonance.
# Based on adopted Jπ.

^{14}N(^{28}Si,d) **1978BaYQ**

1978BaYQ: E=66,70,80 MeV. Measured deuterons using ΔE-E telescope.
At θ=0; no 10+ level found.

^{40}Ca Levels

E(level)[†]	$J^{\pi\dagger}$	$d\sigma/d\Omega$ μb/sr[‡]
6930	6+	$\leq$0.2
8098	8+	$\leq$0.2

† From Adopted Levels.
‡ At 0° and E=70 MeV.

$^{32}S(^{12}C,\alpha)$ **1972Mi08**

1972Mi08: E=30 MeV. Measured $\sigma(E\alpha)$, deduced multiparticle-multihole states.

^{40}Ca Levels

E(level)	J^{π}†	$d\sigma/d\Omega$ (μb/sr)‡	Comments
0	0+	≈0.31	
3350 *25*	0+	3.78	
3700 *25*	3-	≈0.91	
3910 *25*	2+	6.96	
4500 *25*	5-	1.04	
5180 *25*		5.41	
5260 *25*		6.84	
5610 *25*		11.0	E(level): doublet: 5614+5629.
5900 *25*		3.51	E(level): doublet.
6300 *25*		3.51	
6540 *25*		12.3	E(level): triplet: 6508+6543+6582.
6910 *25*		16.0	E(level): triplet: 6909+6931+6938.
7270 *25*		8.17	E(level): triplet: 7239+7278+7301.
7980 *25*		40.3	E(level): triplet: 7973+7977+8019.
8110 *25*		20.7	E(level): triplet: 8091+8113+8135.
8320 *25*		11.8	E(level): multiplet: 8323+8338+8359+8364.
8590 *25*		27.3	E(level): doublet: 8579+8587.
8790 *25*		15.7	E(level): doublet: 8764+8810.

† From Adopted Levels for levels up to 5 MeV. Higher groups are mostly unresolved multiplets.
‡ At θ(lab)=7.5°.

^{36}Ar(α,γ):resonances 1973Wa08,1987He05,1982Pr05

1973Wa08, 1973Br34: E=5.3-16.8 MeV. Measured yield, σ(θ) in giant-resonance region.
1987He05: E=5.48-5.515 MeV. Measured yield of 2814γ from first 2+ level of ^{36}Ar and 2120γ.
1982Pr05: E=5.495-5.505 MeV. Measured excitation functions, γ spectra at 5496 resonance, Δ(Eγ)=1 keV.
1967Na10: E=3-5.7 MeV. Measured σ for 5620 resonance.

^{40}Ca Levels

E(level)[†a]	Jπ[‡]	(2J+1)$\Gamma_\alpha\Gamma_{\gamma 0}/\Gamma$ (eV)[a]	Comments
0	0+		
9868.8		0.14 *3*	
10321	1+		E(level): from Adopted Levels.
11977 *1*[#]			Eα=5486.
11987 *1*[#]	0+		Eα=5497. Proton decay to 2522 level in ^{39}K; α decay to 2814 level in ^{36}Ar. This resonance also studied by 1982Pr05.
11989 *1*[#]			Eα=5499.
11997 *1*[#]			Eα=5508.
12097[&]			Eα=5619.
12202[&]			Eα=5736.
12332[&]			Eα=5880.
12421[&]			Eα=5979.
12971		3.4	Eα=6590.
13249[@]		9.7	Eα=6900.
13484		3.4	Eα=7160.
13718		3.7	Eα=7420.
13952[@]		14.6	Eα=7680.
14096		14.4	Eα=7840.
14419		4.7	Eα=8200.
14509		4.5	Eα=8300.
14869		6.3	Eα=8700.
17669		5.8	Eα=11810.
17858		5.4	Eα=12020.
18146[@]		11.3	Eα=12340.
18326		9.4	Eα=12540.
18452		6.9	Eα=12680.
18731[@]		10.3	Eα=12990.
19037		4.9	Eα=13330.

[†] Eα(c.m.)+S(α)(for ^{40}Ca); Eα(c.m.)=(36/40)Eα(lab); S(α)(^{40}Ca)=7039.65 *21* (2003Au03). The Eα′s given under comments are measured values in the lab system.
[‡] From Adopted Levels.
[#] From 1987He05.
[@] Doublet, see resonances in ^{39}K(p,γ) dataset.
[&] From 1967Na10.
[a] From 1973Wa08 for levels above 12500.

γ(^{40}Ca)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ	Iγ	Γ_γ.[‡]
9868.8		0	0+	9869		
11987	0+	10321	1+	1666.5 *4*[a]	42	0.34 *5*
		9868.8		2119.5 *4*[a]	58	0.45 *7*

[‡] $\Gamma_{\alpha 0}/\Gamma$=0.93 *9* assumed.
[a] From 1982Pr05.

^{36}Ar(^{6}Li,d) 1979Fo04,1994Ya04,1998Ya21

1979Fo04, 1977Be65, 1975Fo04: E=17 MeV. Measured $\sigma(\theta)$, FWHM≈35 keV; 0+ levels.
1994Ya04, 1998Ya21, 1993Ya07: E=50 MeV. Measured $\sigma(\theta)$, FWHM=50-70 keV. Deduced L and S values, α cluster states.
1975An13: E=28 MeV. Measured σ and S for g.s.

^{40}Ca Levels

E(level)[†]	J$^{\pi}$[‡]	L[#]	S[#]	Comments
0	0+	0	0.30	
3350.5 *18*	0+	0	0.21	
3736 *3*	3-	3	0.06	
3909 *3*	2+	2	0.26	
4494.4 *9*		5	0.016	
5206 *6*		0+2	0.18,0.18	E(level): doublet 5210+5250.
5283 *4*		4	0.19	
5625.9 *10*		2	0.05	E(level): doublet 5614+5628.
5908 *3*		1	0.025	
6034 *5*		(2,3)		E(level): doublet 6025+6029.
6285.1 *12*		3	0.026	
6501 *4*		4[@]	0.030[@]	
6534 *4*		4[@]	0.036[@]	
6577 *3*		3	0.087	
6756.8 *17*		2		
6900		2	0.12	
6930		6	0.25	
7300		0		E(level): unresolved multiplet with L=0 from $\sigma(\theta)$ distribution and cross section below 3% of that to g.s. (1975Fo04).
7460		(2)	(0.04)	
7560		4	0.04	
7690		0	0.18	
7870		3	0.066	
7900		2		
8050		2	0.15	
8150		1	0.21	
8270		4	0.055	
8280		0		E(level): from 1975Fo04.
8380		4	0.043	
8420		0		E(level): from 1975Fo04.
8550		3	0.076	
8600		2	0.11	
8780		2	0.11	
8930		2	0.14	
9140		(0,1)	0.50,0.15	
9240		6	0.11	
9360		3	0.10	
9500		2	0.10	
9700		3	0.20	
9870		2	0.14	
9950		1+5	0.034,0.01	
10080		2	0.20	
10150		5	0.06	
10340		8	0.25	L: from 1993Ya07.
10590		3	0.10	
10690		7		
10700		1	0.28	
10800		5	0.14	
10900		3	0.11	
11100		0	0.60	
11210		0	0.62	
11300		4	0.40	
11370		5	0.12	
11470		5	0.12	

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^{40}Ca Levels (continued)

E(level)†	Jπ‡	L#	S#	Comments
11690		7	0.10	
11800		5	0.08	
12020		2	0.15	
12100		2	0.19	
12170		2	0.13	
12340		5	0.10	
12450		4	0.061	
12650		7	0.11	
12720		3	0.20	
12900		4	0.07	
13050		4	0.06	
13200		4	0.05	
13300		4	0.045	
13470		4	0.28	
13620		6	0.016	
13720		6	0.023	
13830		7	0.18	
14000		4	0.06	
14190		4	0.07	
14380		6	0.03	
14500		6	0.03	
14680				
14750		4	0.078	
14850		(9)	(0.33)	
15060				
15140				
15250				
15330				
15600				
15700				

† From 1979Fo04 below 7400, from 1998Ya21 above 7400.
‡ From Adopted Levels.
# From 1994Ya04. 1979Fo04 five L and S values for levels below 7000; 1975Fo04 give L=0 for four levels above 7000.
@ Doublet 6500+6530 not resolved by 1994Ya04; relative S values from 1979Fo04 using summed value of 0.066 from 1994Ya04.

^{36}Ar(^{7}Li,t) 1970CoZA

1970CoZA: E=16.6 MeV; measured $\sigma(\theta)$, θ=25° - 60°.
1973Te04: E=28 MeV. Measured triton spectra.

^{40}Ca Levels

E(level)†	J$^{\pi}$	Comments
3900		
5265		E(level): doublet: 5250+5280.
5615		E(level): doublet: 5610+5620.
6290		
6525		E(level): doublet: 6510+6540.
7010		E(level): doublet: 6910+7110.

† There are many additional peaks (probably multiplets) in the triton spectrum shown by 1970CoZA.

^{36}Ar(^{16}O,^{12}C) 1972Br40

1972Br40: E=45 MeV. Measured ^{12}C spectra, deduced rotational band based on excited 0+.
1973Te04: (^{16}O,^{12}Cγ) E=58 MeV. Measured (^{12}C)γ coin; γ-ray data for 3904 and 5278 levels. See (HI,xnγ) dataset.

^{40}Ca Levels

E(level)	J$^{\pi}$	Comments
3353	0+	E(level): from Adopted Levels; not seen in (^{16}O,^{12}C).
3.9×10^{3} *1*	(2+)	
5.25×10^{3} *10*	(4+)	
6.9×10^{3} *1*	(6+)	
9.9×10^{3} *1*	(8+)	
12.4×10^{3} *1*	(10+)	

^{38}Ar(^{3}He,n) 1977Bo16

1977Bo16: E=11.5 MeV. Measured neutrons by tof, $\sigma(\theta)$, FWHM≈50 keV.
1973Al23: E=15 MeV. Measured neutrons by tof, $\sigma(\theta)$, θ=0° - 40°, FWHM≈100 keV.

^{40}Ca Levels

E(level)	J$^{\pi}$	L	dσ/dΩ (max) (mb/sr)†	Comments
0	0+	0	1.40	
3350 *50*		0	0.08	
3900 *50*		2	0.15‡	
5.21×10^{3} *10*#			<0.04	
6950 *50*		1	0.20	S: at 10°.
7800 *50*		0	0.10	
8050 *50*		2	0.16‡	
8280 *50*		0	0.56	
8470 *50*		0	0.53	
9380 *50*		0	0.40	
9600 *50*		2	0.24‡	
10.65×10^{3} *10*#		0	0.14	
11980		0	0.28	

† At 0°, except where noted.
‡ At 25°.
# From 1973Al23.

^{39}K(p,γ) **1990Ki07,1988Sc23**

Jπ(^{39}K g.s.)=3/2+.
Includes data for resonances.
1990Ki07: E=0.3-2.9 MeV. Measured Eγ, Iγ, lifetimes by DSAM.
1988Sc23: E=1.0-1.6 MeV. Measured Eγ, Iγ.
1985Se16: E=3.79-3.85 MeV. Measured Eγ, Iγ, resonances.
1981Ch04: E=0.7-2.9 MeV. Measured $\gamma(\theta)$, branching ratios.
1973Di02: E=6.5-17.5 MeV. Measured $\gamma(\theta)$, yields.
1971Da08 (also 1973DaYL): E=2.6-2.82 MeV, measured resonances.
1968Ba22: E=2.9-6.0 MeV. Measured σ, resonances.
1967Le12, 1966Le08, 1963Le08: measured γ, deduced Jπ's.
Others: 1988Al16, 1987Gu01, 1979Pa16 (also 1980PaZP), 1971Si29, 1971Ir01, 1970De30, 1970He08, 1968Li12, 1968Do12, 1967Fe04, 1966Go23, 1966En04, 1964Ta05, 1964Si16, 1964Ha35, 1963Si13, 1962Ra07, 1962Du05, 1961Po05, 1961Ec03.

^{40}Ca Levels

E(p)(lab) are given under comments, values are primarily from 1990Ki07 up to 2910, from 1985Se16 for 3804-3841, from 1968Ba22 from 3863-5805, from 1973Di02 from 10190-14090.

E(level)[†@]	Jπ[‡]	$T_{1/2}$[#]	S(p,γ) (eV)[b]	Comments
0	0+			
3352.62 *9*	0+			
3736.69 *5*	3-[&]			
3904.38 *4*	2+[&]			
4491.44 *4*	5-[&]			
5211.7 *3*	0+			
5248.81 *5*	2+			
5278.81 *6*	4+			
5613.53 *3*	4-			
5629.43 *8*	2+			
5902.63 *8*	1-			
6025.47 *5*	2-			
6029.71 *6*	3+			
6285.15 *4*	3-			
6507.84 *13*	4+			
6542.78 *9*	4+			
6582.54 *15*	3-			
6750.41 *7*	2-			
6908.70 *8*	2+			
6931.29 *6*[a]	3-	1.4 ps *6*		
6950.49 *7*	1-			
7113.0	1-			γ branching ratios not available.
7113.73 *6*	4-	76 fs *28*		
7239.07 *8*[a]	(3-,4,5-)			
7277.82 *8*[a]	(2,3)+			
7300.74 *20*	0+			
7446.23 *6*[a]	(3,4)+			
7466.37 *8*	2+	18 fs *14*		
7481				E(level): from 1971Da08 only.
7532.26 *5*	2-	0.22 ps *7*		
7561.18 *7*	3+			
7623.11 *8*	(2-,3,4+)			
7658.23 *5*	4-			
7676.6	6+			
7694.15 *25*	3-			
7701.8 *4*	0+			
7769.4	(3,4,5)-			
7872.18 *9*	2+			
7928.42 *10*	4+			
7976				E(level): from 1971Da08 only.

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^{40}Ca Levels (continued)

E(level)[†@]	Jπ[‡]	$T_{1/2}$[#]	S(p,γ) (eV)[b]	Comments
8091.61 *17*	2+			
8134.76 *10*	(2-,3,4+)			30% γ-branching undetermined.
8187.69 *13*				
8323.16 *8*	(1-,2+)	83 fs *28*		11% *2* γ-branching undetermined.
8338.0 *3*				15% *8* γ-branching undetermined.
8373.94 *15*	4+			30% *20* γ-branching undetermined.
8424.81 *11*	2-			
8439.0 *5*	0+			
8484.02 *13*	0+			
8578.80 *9*	2+			
8678.29 *10*	4+	42 fs *35*		22% *16* γ-branching undetermined.
8748.20 *9*	2+			
8764.18 *6*	3-			≈9% γ-branching undetermined.
8934.81 *7*	2+		0.09 *4*	E(p)(lab)=622.23 *12*.
8978				E(level): from 1971Da08 only.
8994.50 *11*	(1-,2+)		0.15 *6*	E(p)(lab)=683.45 *15*.
9031.9 *3*	4-			$\Gamma_p=1.5\Gamma_\gamma$ from intensity balance.
9091.70 *6*	3-		0.28 *11*	E(p)(lab)=783.23 *11*.
9135.66 *5*	(3)-		0.6 *2*	E(p)(lab)=822.27 *11*.
9209.77 *5*	(1,2,3)-		0.39 *16*	E(p)(lab)=904.29 *11*.
9226.69 *5*	(1-,2,3-)		0.28 *11*	S: for 9226.69+9227.43. E(p)(lab)=921.66 *11*.
9227.43 *7*	(1,2+)		0.28 *11*	S: for 9226.69+9227.43. E(p)(lab)=922.42 *12*. 5% *2* γ-branching undetermined.
9362.54 *6*	3-		0.43 *17*	14% *3* γ-branching undetermined. E(p)(lab)=1061.01 *11*.
9377.8 *2*			0.24 *10*	E(p)(lab)=1076.70 *18*.
9388.20 *19*	2+		0.26 *10*	E(p)(lab)=1087.35 *17*.
9395.7 *3*			0.09 *4*	E(p)(lab)=1095.0 *3*.
9404.85 *19*	2-		0.36 *14*	E(p)(lab)=1104.43 *17*.
9406.4 *6*			0.40 *10*	E(p)(lab)=1106.0 *6*.
9412.4 *2*			0.18 *7*	E(p)(lab)=1112.2 *2*.
9418.8 *2*	3-		0.6 *2*	E(p)(lab)=1118.76 *18*.
9429.11 *5*	(3,4)-		0.2 *2*	E(p)(lab)=1129.32 *11*.
9432.46 *18*	1-		2.6 *11*	E(p)(lab)=1132.8 *4*.
9453.95 *5*	3-		0.8 *3*	E(p)(lab)=1154.85 *11*.
9500.0 *15*			0.42 *17*	E(p)(lab)=1202.0 *15*.
9536.35 *16*			1.1 *4*	E(p)(lab)=1239.33 *13*.
9537.9 *5*			0.24 *10*	E(p)(lab)=1240.9 *5*.
9603.0 *4*	3-		2.4 *10*	E(p)(lab)=1307.7 *4*.
9604.6 *4*	1-		5 *2*	E(p)(lab)=1309.7 *4*.
9632.8 *11*			≈0.2	S: 1981Ch04. Not observed by 1990Ki07 (s<0.15). E(p)(lab)=1337.2 *10*.
9640.89 *7*	2-		5 *2*	E(p)(lab)=1346.58 *15*. Jπ: 2(+) from 1963Le08.
9655.6 *9*			0.22 *9*	E(p)(lab)=1361.7 *9*.
9662.3 *2*			0.6 *2*	E(p)(lab)=1368.6 *2*.
9668.71 *8*	3-		2.4 *10*	E(p)(lab)=1375.12 *12*.
9779.49 *7*	3		2.2 *9*	E(p)(lab)=1488.53 *12*.
9785.3 *2*	(1,2+)		1.0 *4*	E(p)(lab)=1494.68 *19*.
9802.2 *7*			0.37 *15*	E(p)(lab)=1512.2 *7*.
9807.3 *11*			≈0.2	E(p)(lab)=1516.2 *10*. From 1981Ch04. Not observed by 1990Ki07 (s<0.2).
9811.1 *2*			0.27 *11*	E(p)(lab)=1521.18 *18*.
9829.54 *16*			0.8 *3*	E(p)(lab)=1540.11 *14*.
9835.08 *19*			0.6 *3*	E(p)(lab)=1545.79 *17*.
9854.54 *17*			1.1 *4*	E(p)(lab)=1565.76 *15*.
9859.7 *3*			0.5 *2*	E(p)(lab)=1571.1 *3*.

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^{40}Ca Levels (continued)

E(level)[†@]	Jπ[‡]	$T_{1/2}$[#]	S(p,γ) (eV)[b]	Comments
9865.15 *11*	1		6 *2*	E(p)(lab)=1576.74 *15*.
9869.3 *4*	1+		3.1 *12*	E(p)(lab)=1580.9 *4*.
9898.6 *3*			0.6 *2*	E(p)(lab)=1611.0 *3*.
9921.4 *2*			0.43 *17*	E(p)(lab)=1634.33 *18*.
9939.8 *2*			0.13 *5*	E(p)(lab)=1653.2 *2*.
9954.00 *9*	4+		1.6 *6*	E(p)(lab)=1667.80 *13*. 5% *2* γ-branching undetermined.
9977.20 *17*			1.1 *4*	E(p)(lab)=1691.60 *15*.
9993.7 *15*			0.5 *2*	E(p)(lab)=1708.6 *15*.
10040.54 *9*	(2-,3-)		0.5 *2*	E(p)(lab)=1756.58 *13*.
10045.7 *5*				E(p)(lab)=1761.9 *5*.
10049.38 *7*	4-		4.5 *19*	E(p)(lab)=1765.58 *12*.
10058.0 *3*			0.17 *7*	E(p)(lab)=1774.5 *2*.
10080.7 *2*			0.9 *4*	E(p)(lab)=1797.78 *18*.
10130.70 *19*			1.4 *6*	E(p)(lab)=1849.07 *17*.
10136.7 *16*			≈0.5	E(p)(lab)=1854.1 *15*. From 1981Ch04. Not observed by 1990Ki07 (s<0.3).
10199.2 *4*			0.6 *2*	E(p)(lab)=1919.3 *4*.
10205.1 *8*			0.23 *9*	E(p)(lab)=1925.4 *8*.
10210.6 *2*			1.4 *6*	E(p)(lab)=1931.0 *2*.
10232.8 *7*			1.3 *5*	E(p)(lab)=1953.8 *7*.
10262.53 *10*	3-		1.3 *5*	E(p)(lab)=1984.32 *14*.
10267.7 *5*			0.19 *8*	E(p)(lab)=1989.6 *5*.
10274.8 *3*			0.28 *11*	E(p)(lab)=1996.9 *3*.
10277.9 *2*			0.7 *3*	E(p)(lab)=2000.1 *2*.
10285.0 *3*			0.7 *3*	E(p)(lab)=2007.4 *3*.
10318.8 *4*	1+		14.3 *10*	E(p)(lab)=2042.0 *4*. Jπ: 1963Le08. S: from 1981Ch04, used for calibration.
10332.6 *15*			0.8 *3*	E(p)(lab)=2056.2 *15*.
10358.6 *15*			0.6 *2*	E(p)(lab)=2082.9 *15*.
10361.5 *15*			2.1 *8*	E(p)(lab)=2085.9 *15*.
10375.5 *15*			1.2 *5*	E(p)(lab)=2100.2 *15*.
10383.90 *16*			2.0 *8*	E(p)(lab)=2108.83 *13*.
10415.06 *6*	3		5.8 *19*	E(p)(lab)=2140.80 *11*. 2.5% *18* γ-branching undetermined.
10420.7 *10*			0.8 *3*	E(p)(lab)=2146.6 *10*.
10430.58 *19*			3.1 *10*	E(p)(lab)=2156.72 *17*.
10441.4 *6*			2.5 *8*	E(p)(lab)=2167.8 *6*.
10443.9 *2*			1.7 *5*	E(p)(lab)=2170.4 *2*.
10470.0 *15*			0.6 *2*	E(p)(lab)=2197.2 *15*.
10478.7 *15*			1.0 *4*	E(p)(lab)=2206.1 *15*.
10503.1 *15*			1.1 *4*	E(p)(lab)=2231.1 *15*.
10514.8 *15*			2.5 *10*	E(p)(lab)=2243.1 *15*.
10527.8 *15*			3.7 *15*	E(p)(lab)=2256.5 *15*.
10540.0 *15*			1.0 *3*	E(p)(lab)=2269.0 *15*.
10552.2 *15*			1.8 *7*	E(p)(lab)=2281.5 *15*.
10632.7 *2*			2.1 *8*	E(p)(lab)=2364.04 *19*.
10639.07 *7*	(3-,4,5-)		11 *4*	E(p)(lab)=2370.61 *12*.
10646.4 *4*			1.5 *6*	E(p)(lab)=2378.1 *4*.
10653.23 *16*			8 *3*	E(p)(lab)=2385.14 *14*.
10670.4 *3*			18 *7*	E(p)(lab)=2402.8 *3*.
10673.69 *17*			5 *2*	E(p)(lab)=2406.13 *15*.
10677 *3*			0.7 *2*	E(p)(lab)=2408 *3*. From 1981Ch04. Not observed by 1990Ki07 (s<0.6).
10691.0 *3*			3.4 *14*	E(p)(lab)=2423.9 *3*.
10699.50 *10*	3		10 *4*	E(p)(lab)=2432.61 *14*. 9.6% *18* γ-branching undetermined.
10720.8 *3*			2.1 *7*	E(p)(lab)=2454.5 *3*.

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^{40}Ca Levels (continued)

E(level)[†@]	Jπ[‡]	$T_{1/2}$[#]	S(p,γ) (eV)[b]	Comments
10737.7 *3*	1-		4.6 *18*	E(p)(lab)=2471.8 *3*. 24% *3* γ-branching undetermined.
10747.8 *4*	4+		15 *6*	E(p)(lab)=2482.2 *4*.
10753.85 *18*			4.5 *18*	E(p)(lab)=2488.37 *16*.
10770.2 *3*	(1+)		7 *3*	E(p)(lab)=2505.1 *3*. 17% *2* γ-branching undetermined.
10776.3 *3*			16 *6*	E(p)(lab)=2511.4 *3*.
10780.9 *3*			6 *2*	E(p)(lab)=2516.1 *3*.
10787.7 *3*			3.0 *12*	E(p)(lab)=2523.1 *3*.
10800.0 *10*			1.1 *4*	E(p)(lab)=2535.7 *10*.
10813.7 *5*			12.0 *5*	E(p)(lab)=2549.8 *5*.
10830.0 *6*			2.7 *10*	E(p)(lab)=2566.5 *6*.
10848.5 *4*			4.4 *17*	E(p)(lab)=2585.5 *4*.
10868.8 *4*			5.2 *19*	E(p)(lab)=2606.3 *4*.
10910.0 *4*			7 *3*	E(p)(lab)=2648.6 *4*. γ decay from 1971Da08.
10921.1 *4*			9 *4*	γ decay from 1971Da08, 40% γ-branching uncertain. E(p)(lab)=2659.9 *4*.
10934.4 *5*			5 *2*	E(p)(lab)=2673.6 *5*.
10951.5 *4*			16 *4*	E(p)(lab)=2691.1 *4*.
10956.0 *4*	(3-,4+,5-)		4.0 *16*	E(p)(lab)=2695.8 *4*. γ decay and Jπ=(3-) from 1971Da08.
10976.3 *5*			9 *3*	E(p)(lab)=2716.6 *5*.
10988.0 *4*	2-		8 *3*	E(p)(lab)=2728.6 *4*. γ decay from 1971Da08.
10994.7 *4*	(1-)		11 *4*	E(p)(lab)=2735.5 *4*. γ decay from 1971Da08; branching ratios not available.
11002.4 *5*			2.9 *12*	E(p)(lab)=2743.4 *5*.
11011.0 *4*	3-		14 *5*	E(p)(lab)=2752.2 *4*. 17% *3* γ-branching undetermined.
11023.8 *5*			6 *2*	E(p)(lab)=2765.3 *5*.
11042.0 *5*	2+		6 *2*	E(p)(lab)=2784.0 *5*. γ decay from 1971Da08.
11070.0 *6*	(3)		31 *12*	E(p)(lab)=2813.3 *4*. γ decay and J from 1971Da08; (1-:4+) in Adopted Levels.
11080				E(p)(lab)=2821. E(level): level from 1971Da08.
11117.1 *5*			5 *2*	E(p)(lab)=2861.0 *5*.
11127.2 *5*			6 *2*	E(p)(lab)=2871.4 *5*.
11165.3 *4*			2.0 *8*	E(p)(lab)=2910.5 *4*.
12038 *3*[f]				E(p)(lab)=3804 *3*. Γ_p(to 3352)=0.07 keV *3*. Resonance strengths: 0.9 eV *4* to g.s., 1.0 eV *5* (first 2+ to g.s.), 2.3 eV *8* (first 3- to g.s.) (1985Se16). Also (p,p′) to first 2+.
12049 *3*[f]				E(p)(lab)=3815 *3*. Γ_p(to 3352)=0.66 keV *13*. Resonance strengths: 0.7 eV *3* to g.s., 1.2 eV *6* (first 2+ to g.s.), 0.5 eV *2* (first 3- to g.s.) (1985Se16). Also (p,p′) to first 2+.
12068 *3*[f]				E(p)(lab)=3834 *3*. Resonance strengths: 9 eV *3* to g.s.
12074 *3*[f]				E(p)(lab)=3841 *3*. Γ_p(to 3352)=0.030 keV *17* Resonance strengths: 0.7 eV *3* to g.s., 1.5 eV *6* (first 2+ to g.s.), 1.1 eV *5* (first 3- to g.s.) (1985Se16). Also (p,p′) to first 2+.
12099[d]			5.1[e]	E(p)(lab)=3863 *10*.
12111[d]			3.5[e]	E(p)(lab)=3875 *10*.
12204[d]			2.5[e]	E(p)(lab)=3970 *10*.
12334[d]			3.4[e]	E(p)(lab)=4104 *10*.

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^{40}Ca Levels (continued)

E(level)[†@]	Jπ[‡]	$T_{1/2}$[#]	S(p,γ) (eV)[b]	Comments
12423[d]			2.3[e]	E(p)(lab)=4195 *10*.
12604[d]			5.9[e]	E(p)(lab)=4380 *10*.
12647[d]				E(p)(lab)=4425 *10*.
12668[d]			14.5[e]	E(p)(lab)=4446 *10*.
12688[d]			4.4[e]	E(p)(lab)=4467 *10*.
12875[d]			6.1[e]	E(p)(lab)=4658 *10*.
12980[d]			4.2[e]	E(p)(lab)=4766 *10*.
12996[d]				E(p)(lab)=4783 *10*.
13086[d]			2.1[e]	E(p)(lab)=4875 *10*.
13113[d]			18.4[e]	E(p)(lab)=4903 *10*.
13194[d]			13.9[e]	E(p)(lab)=4986 *10*.
13203[d]			6.1[e]	E(p)(lab)=4995 *10*.
13289[d]			8.1[e]	E(p)(lab)=5083 *10*.
13822[d]			2.9[e]	E(p)(lab)=5630 *10*.
13913[d]			56.0[e]	E(p)(lab)=5723 *10*.
13993[d]			112.0[e]	E(p)(lab)=5805 *10*.
18260 *5*[c]				E(p)(lab)=10190.
18680 *5*[c]				E(p)(lab)=10620.
19070 *5*[c]				E(p)(lab)=11020.
19450 *5*[c]				E(p)(lab)=11410.
19850 *5*[c]				E(p)(lab)=11820.
20130 *5*[c]				E(p)(lab)=12110.
20430 *5*[c]				E(p)(lab)=12420.
20650 *5*[c]				E(p)(lab)=12640.
20940 *5*[c]				E(p)(lab)=12940.
21490 *5*[c]				E(p)(lab)=13500.
21690 *5*[c]				E(p)(lab)=13710.
22060 *5*[c]				E(p)(lab)=14090.

† Weighted average from 1990Ki07 and 1988Sc23 for levels below 8200; from 1990Ki07 for levels above 8200, except when stated otherwise.
‡ From Adopted Levels unless otherwise stated.
\# From DSAM (1990Ki07).
@ From 1990Ki07 and 1988Sc23.
& Spin from pγγ(θ) (1963Le08).
a Level not reported by 1988Sc23.
b From 1990Ki07, unless otherwise stated.
c From 1973Di02; E(p)=6.5-17.5 MeV (Δ(E(p))≈5 keV).
d From 1968Ba22.
e $(2J+1)\Gamma_p\Gamma_0/\Gamma$ (eV) from 1968Ba22, using Γ=26 eV for E(p)=2050 resonance (2042.0 resonance listed here).
f From 1985Se16.

γ(^{40}Ca)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.	δ
3352.62	0+	0	0+	3352.5			
3736.69	3-	3352.62	0+	384.1	<0.04		
		0	0+	3736.5	100		
3904.38	2+	3736.69	3-	167.7	<0.9		
		3352.62	0+	551.8	<0.1		
		0	0+	3904.2	100		
4491.44	5-	3736.69	3-	754.7	100	Q(+O)[a]	+0.05 *3*[a]
		3352.62	0+	1138.8	<0.9		
		0	0+	4491.2	<1.6		
5211.7	0+	4491.44	5-	720.2	<1.3		
		3904.38	2+	1307.3	100		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		3736.69	3-	1475.0	<1.3		
5248.81	2+	4491.44	5-	757.4	<1.1		
		3904.38	2+	1344.4	15.1 *9*		
		3736.69	3-	1512.1	<0.6		
		3352.62	0+	1896.1	5.1 *6*		
		0	0+	5248.4	79.8 *12*		
5278.81	4+	4491.44	5-	787.4	1.0 *8*		
		3904.38	2+	1374.4	99.0 *15*		
		3736.69	3-	1542.1	<0.9		
		0	0+	5278.4	<1.8		
5613.53	4-	5278.81	4+	334.7	<7		
		5248.81	2+	364.7	<6		
		5211.7	0+	401.8	<6		
		4491.44	5-	1122.1	29.5 *20*		
		3904.38	2+	1709.1	<2		
		3736.69	3-	1876.8	70.5 *20*		
		3352.62	0+	2260.8	<3		
5629.43	2+	5278.81	4+	350.6	<1.1		
		5248.81	2+	380.6	<1.0		
		5211.7	0+	417.7	<1.6		
		4491.44	5-	1138.0	<0.6		
		3904.38	2+	1725.0	<0.8		
		3736.69	3-	1892.7	<1.1		
		3352.62	0+	2276.7	12.3 *9*		
		0	0+	5629.0	87.7 *9*		
5902.63	1-	5613.53	4-	289.1	<0.6		
		5278.81	4+	623.8	<0.5		
		5248.81	2+	653.8	<0.5		
		5211.7	0+	690.9	<0.5		
		4491.44	5-	1411.2	<0.7		
		3904.38	2+	1998.2	<0.8		
		3736.69	3-	2165.9	<9		
		3352.62	0+	2549.9	<5		
		0	0+	5902.2	100		
6025.47	2-	5902.63	1-	122.8	<3		
		5629.43	2+	396.0	<0.4		
		5613.53	4-	411.9	<0.4		
		5278.81	4+	746.7	<0.4		
		5248.81	2+	776.7	<0.4		
		5211.7	0+	813.8	<0.4		
		4491.44	5-	1534.0	<0.5		
		3904.38	2+	2121.0	18.5 *22*		
		3736.69	3-	2288.7	81.5 *22*		
		3352.62	0+	2672.8	<0.7		
		0	0+	6025.0	<1.8		
6029.71	3+	5902.63	1-	127.1	<4		
		5629.43	2+	400.3	<2		
		5613.53	4-	416.2	<2		
		5278.81	4+	750.9	<1		
		5248.81	2+	780.9	20 *3*		
		5211.7	0+	818.0	<1		
		4491.44	5-	1538.2	<6		
		3904.38	2+	2125.3	80 *3*		
		3736.69	3-	2293.0	<6		
		3352.62	0+	2677.0	<5		
		0	0+	6029.2	<4		
6285.15	3-	6029.71	3+	255.4	<0.3		
		6025.47	2-	259.7	<0.3		
		5902.63	1-	382.5	<0.3		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		5629.43	2+	655.7	<0.6		
		5613.53	4-	671.6	0.9 *2*		
		5278.81	4+	1006.3	<0.4		
		5248.81	2+	1036.3	<0.3		
		5211.7	0+	1073.4	<0.3		
		4491.44	5-	1793.7	72.0 *8*		
		3904.38	2+	2380.7	19.7 *5*		
		3736.69	3-	2548.4	3.2 *4*		
		3352.62	0+	2932.4	<0.7		
		0	0+	6284.6	4.2 *5*		
6507.84	4+	5902.63	1-	605.2	<3		
		5629.43	2+	878.4	<2		
		5613.53	4-	894.3	<2		
		5278.81	4+	1229.0	<3		
		5248.81	2+	1259.0	15 *3*		
		5211.7	0+	1296.1	<3		
		4491.44	5-	2016.4	<2		
		3904.38	2+	2603.4	85 *3*		
		3736.69	3-	2771.1	<3		
		3352.62	0+	3155.1	<3		
		0	0+	6507.3	<9		
6542.78	4+	6029.71	3+	513.1	<5		
		6025.47	2-	517.3	<2		
		5902.63	1-	640.1	<1		
		5629.43	2+	913.3	19 *2*		
		5613.53	4-	929.2	<2		
		5278.81	4+	1264.0	8 *2*		
		5248.81	2+	1294.0	14 *2*		
		4491.44	5-	2051.3	<2		
		3904.38	2+	2638.3	59 *2*		
		3736.69	3-	2806.0	<3		
		0	0+	6542.2	<4		
6582.54	3-	6029.71	3+	552.8	<0.5		
		6025.47	2-	557.1	<0.6		
		5902.63	1-	679.9	<0.5		
		5629.43	2+	953.1	<0.5		
		5613.53	4-	969.0	16 *3*		
		5278.81	4+	1303.7	<0.9		
		5248.81	2+	1333.7	<0.8		
		5211.7	0+	1370.8	<0.8		
		4491.44	5-	2091.0	3 *2*		
		3904.38	2+	2678.1	15.8 *11*		
		3736.69	3-	2845.7	65.1 *13*		
		3352.62	0+	3229.8	<3		
		0	0+	6582.0	<2		
6750.41	2-	6029.71	3+	720.7	<3		
		6025.47	2-	724.9	<2		
		5902.63	1-	847.8	<3		
		5629.43	2+	1121.0	<7		
		5613.53	4-	1136.9	<2		
		5278.81	4+	1471.6	<3		
		5248.81	2+	1501.6	<8		
		5211.7	0+	1538.7	<3		
		4491.44	5-	2258.9	<3		
		3904.38	2+	2845.9	<10		
		3736.69	3-	3013.6	100		
		3352.62	0+	3397.6	<8		
		0	0+	6749.8	<8		
6908.70	2+	6029.71	3+	879.0	<0.3		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.	δ
		6025.47	2-	883.2	<0.3		
		5902.63	1-	1006.1	<0.3		
		5629.43	2+	1279.3	<0.6		
		5613.53	4-	1295.2	<0.4		
		5278.81	4+	1629.9	<0.9		
		5248.81	2+	1659.9	<0.4		
		5211.7	0+	1697.0	<0.4		
		4491.44	5-	2417.2	<0.6		
		3904.38	2+	3004.2	<0.7		
		3736.69	3-	3171.9	<0.9		
		3352.62	0+	3555.9	<1.2		
		0	0+	6908.1	100		
6931.29	3-	6025.47	2-	905.8	<0.2		
		5902.63	1-	1028.7	<0.2		
		5629.43	2+	1301.8	5.8 *3*		
		5613.53	4-	1317.7	2.0 *3*		
		5278.81	4+	1652.4	<0.3		
		5248.81	2+	1682.4	6.1 *3*		
		5211.7	0+	1719.6	<0.2		
		4491.44	5-	2439.8	1.4 *3*		
		3904.38	2+	3026.8	2.0 *5*		
		3736.69	3-	3194.5	82.7 *7*		
		3352.62	0+	3578.5	<0.4		
		0	0+	6930.7	<3		
6950.49	1-	6029.71	3+	920.8	<2		
		6025.47	2-	925.0	<2		
		5902.63	1-	1047.9	<2		
		5629.43	2+	1321.0	<2		
		5613.53	4-	1336.9	<8		
		5278.81	4+	1671.6	<5		
		5248.81	2+	1701.6	<2		
		5211.7	0+	1738.8	<2		
		4491.44	5-	2459.0	<6		
		3904.38	2+	3046.0	<4		
		3736.69	3-	3213.7	<5		
		3352.62	0+	3597.7	<6		
		0	0+	6949.8	100		
7113.0	1-	3904.38	2+	3208.5			
		0	0+	7113.3			
7113.73	4-	6029.71	3+	1084.0	<0.3		
		6025.47	2-	1088.2	1.1 *3*		
		5902.63	1-	1211.1	<0.5		
		5629.43	2+	1484.3	<0.4		
		5613.53	4-	1500.2	6.8 *7*		
		5278.81	4+	1834.9	1.7 *3*		
		5248.81	2+	1864.9	<0.6		
		5211.7	0+	1902.0	<0.4		
		4491.44	5-	2622.2	27.0 *13*		
		3904.38	2+	3209.2	<0.8		
		3736.69	3-	3376.9	66.2 *9*		
		3352.62	0+	3760.9	<1.0		
		0	0+	7113.1	<1.2		
7239.07	(3-,4,5-)	3736.69	3-	3502.2			
7277.82	(2,3)+	6029.71	3+	1248.1	<3		
		6025.47	2-	1252.3	<6		
		5629.43	2+	1648.4	<5		
		5613.53	4-	1664.3	<4		
		5278.81	4+	1999.0	<10		
		5248.81	2+	2029.0	<6		

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		5211.7	0+	2066.1	<5		
		4491.44	5-	2786.3	<7		
		3736.69	3-	3541.0	100		
		3352.62	0+	3925.0	<5		
		0	0+	7277.1	<3		
7300.74	0+	6029.71	3+	1271.0	<1.2		
		6025.47	2-	1275.3	<1.2		
		5902.63	1-	1398.1	<6		
		5629.43	2+	1671.3	4.0 *15*		
		5613.53	4-	1687.2	<1.0		
		5278.81	4+	2021.9	<1.3		
		5248.81	2+	2051.9	96.0 *15*		
		4491.44	5-	2809.2	<6		
		3904.38	2+	3396.2	<5		
		3736.69	3-	3563.9	<2		
7446.23	(3,4)+	6029.71	3+	1416.5	<0.4		
		6025.47	2-	1420.7	<0.4		
		5902.63	1-	1543.6	<0.4		
		5629.43	2+	1816.8	12.8 *7*		
		5613.53	4-	1832.7	20.7 *8*		
		5278.81	4+	2167.4	23.8 *12*		
		5248.81	2+	2197.4	42.7 *11*		
		5211.7	0+	2234.5	<0.4		
		4491.44	5-	2954.7	<1.4		
		3904.38	2+	3541.7	<2		
		3736.69	3-	3709.4	<0.9		
		3352.62	0+	4093.4	<0.7		
		0	0+	7445.5	<0.8		
7466.37	2+	6029.71	3+	1436.6	<0.4		
		6025.47	2-	1440.9	<0.4		
		5902.63	1-	1563.7	<0.4		
		5629.43	2+	1836.9	<0.6		
		5613.53	4-	1852.8	<1.1		
		5278.81	4+	2187.5	<0.6		
		5248.81	2+	2217.5	13.2 *17*		
		5211.7	0+	2254.6	<0.6		
		4491.44	5-	2974.8	<1.0		
		3904.38	2+	3561.8	19.9 *14*		
		3736.69	3-	3729.5	<1.7		
		3352.62	0+	4113.5	11.6 *10*		
		0	0+	7465.6	55.3 *19*		
7481		0	0+	7480			
7532.26	2-	6285.15	3-	1247.1	9.8 *9*		
		6029.71	3+	1502.5	<1.4		
		6025.47	2-	1506.8	4.8 *4*		
		5902.63	1-	1629.6	3.4 *10*		
		5629.43	2+	1902.8	<0.6		
		5613.53	4-	1918.7	24.2 *14*		
		5278.81	4+	2253.4	<1.4		
		5248.81	2+	2283.4	<3		
		5211.7	0+	2320.5	<0.7		
		4491.44	5-	3040.7	<0.9		
		3904.38	2+	3627.7	15.3 *14*		
		3736.69	3-	3795.4	42.5 *16*		
		3352.62	0+	4179.4	<0.9		
		0	0+	7531.5	<2		
7561.18	3+	6029.71	3+	1531.4	28 *3*		
		6025.47	2-	1535.7	<1.8		
		5902.63	1-	1658.5	<0.6		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		5629.43	2+	1931.7	<0.8		
		5613.53	4-	1947.6	<0.9		
		5278.81	4+	2282.3	<0.9		
		5248.81	2+	2312.3	63 *8*		
		5211.7	0+	2349.4	<1.5		
		4491.44	5-	3069.6	<0.8		
		3904.38	2+	3656.6	<4		
		3736.69	3-	3824.3	9 *2*		
		3352.62	0+	4208.3	<0.6		
		0	0+	7560.4	<1.5		
7623.11	(2-,3,4+)	6029.71	3+	1593.4	<0.5		
		6025.47	2-	1597.6	<0.5		
		5902.63	1-	1720.4	<0.7		
		5629.43	2+	1993.6	35.9 *10*		
		5613.53	4-	2009.5	32.2 *10*		
		5278.81	4+	2344.2	<0.9		
		5248.81	2+	2374.2	11.3 *7*		
		5211.7	0+	2411.3	<0.5		
		4491.44	5-	3131.5	<0.7		
		3904.38	2+	3718.5	<1.0		
		3736.69	3-	3886.2	20.6 *7*		
		3352.62	0+	4270.3	<0.9		
		0	0+	7622.3	<0.5		
7658.23	4-	6285.15	3-	1373.1	13 *2*		
		5613.53	4-	2044.6	39 *3*		
		5278.81	4+	2379.3	<2		
		5211.7	0+	2446.5	<2		
		4491.44	5-	3166.7	22 *3*		
		3904.38	2+	3753.7	<4		
		3736.69	3-	3921.3	26 *3*		
		3352.62	0+	4305.4	<4		
		0	0+	7657.4	<0.3		
7676.6	6+	5278.81	4+	2397.7	100		
7694.15	3-	6029.71	3+	1664.4	<1.2		
		6025.47	2-	1668.6	<1.3		
		5902.63	1-	1791.5	<8		
		5629.43	2+	2064.7	<1.2		
		5613.53	4-	2080.6	9.2 *12*		
		5278.81	4+	2415.3	<1.5		
		5248.81	2+	2445.3	<1.5		
		5211.7	0+	2482.4	<1.7		
		4491.44	5-	3202.6	<2		
		3904.38	2+	3789.6	<2		
		3736.69	3-	3957.3	90.8 *12*		
		3352.62	0+	4341.3	<1.9		
		0	0+	7693.4	<3		
7701.8	0+	6029.71	3+	1672.1	<5		
		6025.47	2-	1676.3	<5		
		3904.38	2+	3797.2	100		
7769.4	(3,4,5)-	5613.53	4-	2155.8	34 *6*		
		3736.69	3-	4032.5	66 *6*		
7872.18	2+	5613.53	4-	2258.6	<6		
		5278.81	4+	2593.3	<5		
		5248.81	2+	2623.3	<11		
		3904.38	2+	3967.6	<5		
		0	0+	7871.4	100[b]		
7928.42	4+	6029.71	3+	1898.7	<4		
		6025.47	2-	1902.9	<4		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.	δ
		5902.63	1-	2025.7	<3		
		5629.43	2+	2298.9	<4		
		5613.53	4-	2314.8	50 *9*		
		5278.81	4+	2649.5	<3		
		5248.81	2+	2679.5	<6		
		5211.7	0+	2716.6	<3		
		4491.44	5-	3436.8	50 *9*		
		3904.38	2+	4023.8	<5		
		3736.69	3-	4191.5	<7		
		3352.62	0+	4575.5	<4		
		0	0+	7927.6	<6		
7976		6542.78	4+	1433			
8091.61	2+	0	0+	8090.7	100		
8134.76	(2-,3,4+)	5629.43	2+	2505.3	28 *3*		
		5613.53	4-	2521.2	8 *3*		
		4491.44	5-	3643.1	<5		
		3904.38	2+	4230.1	34 *10*		
8187.69		3736.69	3-	4450.7	100		
8323.16	(1-,2+)	6750.41	2-	1572.7	7.4 *6*		
		6285.15	3-	2038.0	1.3 *3*		
		6025.47	2-	2297.6	15.6 *10*		
		5902.63	1-	2420.5	1.1 *7*		
		5629.43	2+	2693.6	<0.4		
		5613.53	4-	2709.5	<0.3		
		5278.81	4+	3044.2	<0.3		
		5248.81	2+	3074.2	2.7 *5*		
		5211.7	0+	3111.3	<0.3		
		4491.44	5-	3831.5	<0.5		
		3904.38	2+	4418.5	<1.3		
		3736.69	3-	4586.2	59.4 *19*		
		3352.62	0+	4970.2	<0.3		
		0	0+	8322.2	2.0 *7*		
8338.0		6542.78	4+	1795.2	60 *6*		
		6507.84	4+	1830.1	25 *6*		
8373.94	4+	3904.38	2+	4469.3	70 *20*		
8424.81	2-	6029.71	3+	2395.0	<3		
		6025.47	2-	2399.3	13 *3*		
		5902.63	1-	2522.1	17 *3*		
		5629.43	2+	2795.3	<6		
		5613.53	4-	2811.2	<3		
		5278.81	4+	3145.9	<4		
		5248.81	2+	3175.9	<4		
		5211.7	0+	3213.0	<4		
		4491.44	5-	3933.2	<4		
		3904.38	2+	4520.2	<4		
		3736.69	3-	4687.8	70 *4*		
		3352.62	0+	5071.9	<6		
		0	0+	8423.9	<1.5		
8439.0	0+	5629.43	2+	2809.5	>80		
8484.02	0+	5902.63	1-	2581.3	37 *7*		
		3736.69	3-	4747.0	63 *7*		
8578.80	2+	6029.71	3+	2549.0	<4		
		6025.47	2-	2553.2	<4		
		5629.43	2+	2949.3	<4		
		5613.53	4-	2965.2	<4		
		5278.81	4+	3299.8	<5		
		5248.81	2+	3329.8	<5		
		5211.7	0+	3367.0	<5		
		4491.44	5-	4087.1	<4		

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		3904.38	2+	4674.1	<4		
		3736.69	3-	4841.8	<6		
		3352.62	0+	5225.8	<7		
		0	0+	8577.8	100		
8678.29	4+	6285.15	3-	2393.1	13 *5*		
		3736.69	3-	4941.3	65 *15*		
8748.20	2+	0	0+	8747.2	>80		
8764.18	3-	6029.71	3+	2734.4	16 *6*		
		5629.43	2+	3134.6	19 *7*		
		5278.81	4+	3485.2	34 *10*		
		3904.38	2+	4859.5	22 *6*		
8934.81	2+	7532.26	2-	1402.5	4.6 *4*		
		7277.82	(2,3)+	1657.0	1.3 *2*		
		7113.73	4-	1821.0	0.65 *16*		
		6950.49	1-	1984.3	2.1 *3*		
		6750.41	2-	2184.3	2.1 *3*		
		6582.54	3-	2352.2	0.70 *10*		
		6029.71	3+	2905.0	1.2 *4*		
		6025.47	2-	2909.2	6.6 *7*		
		5902.63	1-	3032.1	0.63 *17*		
		5629.43	2+	3305.2	1.1 *2*		
		5248.81	2+	3685.8	2.1 *9*		
		5211.7	0+	3722.9	1.3 *3*		
		3904.38	2+	5030.1	37.6 *17*		
		3736.69	3-	5197.8	1.1 *5*		
		3352.62	0+	5581.8	8.2 *8*		
		0	0+	8933.7	29 *2*		
8978		3736.69	3-	5241			
8994.50	(1-,2+)	7113.73	4-	1880.7	0.33 *8*		
		6908.70	2+	2085.7	0.46 *11*		
		6750.41	2-	2244.0	0.45 *6*		
		6582.54	3-	2411.9	0.33 *10*		
		6285.15	3-	2709.3	0.48 *12*		
		6025.47	2-	2968.9	1.1 *2*		
		5629.43	2+	3364.9	6.5 *5*		
		5211.7	0+	3782.6	6.1 *5*		
		3904.38	2+	5089.8	6.2 *6*		
		3736.69	3-	5257.4	1.8 *3*		
		3352.62	0+	5641.5	1.6 *4*		
		0	0+	8993.4	74.6 *16*		
9031.9	4-	7694.15	3-	1337.7	10 *3*		
		6285.15	3-	2746.6	10 *3*		
		5902.63	1-	3129.1	<3		
		5629.43	2+	3402.3	<3		
		5613.53	4-	3418.2	40 *5*		
		5278.81	4+	3752.9	12 *5*		
		5248.81	2+	3782.9	<3		
		5211.7	0+	3820.0	<3		
		4491.44	5-	4540.2	28 *5*		
		3904.38	2+	5127.2	<5		
		3352.62	0+	5678.8	<5		
		0	0+	9030.8	<5		
9091.70	3-	7694.15	3-	1397.5	2.14 *17*		
		7623.11	(2-,3,4+)	1468.6	0.76 *9*		
		7466.37	2+	1625.3	0.41 *3*		
		7277.82	(2,3)+	1813.8	1.26 *14*		
		7239.07	(3-,4,5-)	1852.6	0.73 *10*		
		7113.73	4-	1977.9	0.55 *9*		
		6750.41	2-	2341.2	0.57 *14*		

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

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	E_γ[†]	I_γ[‡]	Mult.	δ
		6582.54	3-	2509.1	1.04 *14*		
		6285.15	3-	2806.4	5.1 *3*		
		6029.71	3+	3061.9	2.5 *4*		
		6025.47	2-	3066.1	2.9 *5*		
		5902.63	1-	3188.9	1.5 *2*		
		5278.81	4+	3812.7	8.5 *4*		
		5248.81	2+	3842.7	4.5 *2*		
		3904.38	2+	5187.0	9.4 *4*		
		3736.69	3-	5354.6	58.1 *10*		
9135.66	(3)-	8424.81	2-	710.8	1.01 *9*		
		7872.18	2+	1263.5	0.32 *5*		
		7694.15	3-	1441.5	5.2 *2*		
		7532.26	2-	1603.4	3.7 *2*		
		7277.82	(2,3)+	1857.8	0.25 *4*		
		7113.73	4-	2021.9	1.84 *12*		
		6950.49	1-	2185.1	0.46 *8*		
		6750.41	2-	2385.2	0.62 *9*		
		6582.54	3-	2553.0	2.03 *16*		
		6285.15	3-	2850.4	13.8 *4*		
		6025.47	2-	3110.1	0.25 *10*		
		5902.63	1-	3232.9	3.0 *2*		
		5613.53	4-	3522.0	0.30 *10*		
		5248.81	2+	3886.7	0.49 *17*		
		3904.38	2+	5230.9	8.0 *4*		
		3736.69	3-	5398.6	58.7 *9*		
9209.77	(1,2,3)-	8484.02	0+	725.7	0.94 *10*		
		8424.81	2-	785.0	3.3 *2*		
		7694.15	3-	1515.6	4.5 *2*		
		7113.73	4-	2096.0	1.60 *12*		
		6950.49	1-	2259.2	2.8 *2*		
		6750.41	2-	2459.3	1.95 *17*		
		6582.54	3-	2627.1	2.2 *2*		
		6285.15	3-	2924.5	4.0 *2*		
		6025.47	2-	3184.2	1.6 *2*		
		5902.63	1-	3307.0	10.7 *3*		
		5629.43	2+	3580.2	2.1 *2*		
		3904.38	2+	5305.0	2.9 *3*		
		3736.69	3-	5472.7	61.6 *10*		
9226.69	(1-,2,3-)	7532.26	2-	1694.4	13.3 *7*		
		6950.49	1-	2276.1	2.11 *18*		
		6750.41	2-	2476.2	3.2 *2*		
		6285.15	3-	2941.4	3.7 *2*		
		5902.63	1-	3323.9	0.29 *11*[c]		
		5248.81	2+	3977.7	1.63 *18*[d]		
		3904.38	2+	5321.9	0.30 *10*[e]		
		3736.69	3-	5489.6	5.2 *4*		
		0	0+	9225.6	11.8 *10*[f]		
9227.43	(1,2+)	6025.47	2-	3201.8	13.6 *5*		
		5902.63	1-	3324.7	0.29 *11*[c]		
		5248.81	2+	3978.4	1.63 *18*[d]		
		3904.38	2+	5322.7	0.30 *10*[e]		
		3352.62	0+	5874.4	38.9 *12*		
		0	0+	9226.3	11.8 *10*[f]		
9362.54	3-	8424.81	2-	937.7	1.8 *3*		
		7694.15	3-	1668.4	41.0 *10*		
		7658.23	4-	1704.3	10.9 *8*		
		7623.11	(2-,3,4+)	1739.4	1.6		
		6950.49	1-	2412.0	1.3		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		6750.41	2-	2612.0	1.5		
		6582.54	3-	2779.9	2.6 *3*		
		6285.15	3-	3077.3	3.9 *10*		
		5613.53	4-	3748.8	12.2 *9*		
		5248.81	2+	4113.5	4.4 *8*		
		3904.38	2+	5457.8	5.9 *8*		
		3736.69	3-	5625.4	3.4 *6*		
9388.20	2+	7694.15	3-	1694.0	2.9		
		7300.74	0+	2087.4	1.0		
		6542.78	4+	2845.3	11		
		6507.84	4+	2880.3	3.6		
		6285.15	3-	3102.9	1.3		
		6025.47	2-	3362.6	2.5		
		5629.43	2+	3758.6	7.6		
		5278.81	4+	4109.2	5.9		
		5248.81	2+	4139.2	3.1		
		5211.7	0+	4176.3	11		
		3904.38	2+	5483.4	3.4		
		3736.69	3-	5651.1	6.7		
		0	0+	9387.0	40		
9404.85	2-	7532.26	2-	1872.5	16		
		7277.82	(2,3)+	2127.0	0.8		
		7113.73	4-	2291.1	7.4		
		6950.49	1-	2454.3	1.5		
		6908.70	2+	2496.1	2.9		
		6582.54	3-	2822.2	3.8		
		6285.15	3-	3119.6	37		
		5902.63	1-	3502.1	7.3		
		3904.38	2+	5500.1	2.7		
		3736.69	3-	5667.7	18		
		0	0+	9403.7	2.6		
9418.8	3-	7694.15	3-	1724.6	4.4		
		7658.23	4-	1760.5	2.8		
		7623.11	(2-,3,4+)	1795.6	1.7		
		7532.26	2-	1886.5	2.0		
		7113.73	4-	2305.0	26		
		6750.41	2-	2668.3	2.6		
		6285.15	3-	3133.5	42		
		6025.47	2-	3393.2	2.3		
		5902.63	1-	3516.0	4.9		
		5613.53	4-	3805.1	2.0		
		5248.81	2+	4169.8	1.8		
		3736.69	3-	5681.7	7.5		
9429.11	(3,4)-	7694.15	3-	1734.9	7.7 *10*		
		7658.23	4-	1770.8	36 *2*		
		7623.11	(2-,3,4+)	1806.0	1.2 *4*		
		7113.73	4-	2315.3	1.3 *3*		
		6582.54	3-	2846.5	9.2 *16*		
		6285.15	3-	3143.8	3.4 *6*		
		4491.44	5-	4937.3	29 *2*		
		3736.69	3-	5692.0	12 *2*		
9432.46	1-	7532.26	2-	1900.2	2.3		
		6950.49	1-	2481.9	0.7		
		6750.41	2-	2681.9	0.9		
		6025.47	2-	3406.8	2.1		
		3904.38	2+	5527.7	1.0		
		0	0+	9431.3	93		
9453.95	3-	8424.81	2-	1029.1	1.47 *18*		
		7694.15	3-	1759.8	22.2 *7*		

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		7658.23	4-	1795.7	7.1 *6*		
		7623.11	(2-,3,4+)	1830.8	1.8 *3*		
		7532.26	2-	1921.6	1.0 *2*		
		7446.23	(3,4)+	2007.7	0.7 *2*		
		7113.73	4-	2340.2	10.5 *5*		
		6750.41	2-	2703.4	2.1 *2*		
		6285.15	3-	3168.7	30.3 *7*		
		6025.47	2-	3428.3	1.8 *3*		
		5629.43	2+	3824.3	2.5 *3*		
		5613.53	4-	3840.2	10.2 *6*		
		5278.81	4+	4174.9	1.6		
		3904.38	2+	5549.2	4.9 *6*		
		3736.69	3-	5716.8	3.4 *4*		
9603.0	3-	7113.73	4-	2489.2	33		
		6285.15	3-	3317.7	54		
		3736.69	3-	5865.8	213		
9604.6	1-	7532.26	2-	2072.3	5.0		
		6950.49	1-	2654.0	1.1		
		6750.41	2-	2854.1	1.7		
		6025.47	2-	3579.0	4.1		
		3904.38	2+	5699.8	0.9		
		3352.62	0+	6251.4	1.2		
		0	0+	9603.4	86		
9640.89	2-	7466.37	2+	2174.5	7.9 *3*		
		6950.49	1-	2690.3	0.15 *3*		
		6908.70	2+	2732.1	0.50 *5*		
		6285.15	3-	3355.6	0.47 *11*		
		5629.43	2+	4011.2	4.70 *10*		
		3904.38	2+	5736.1	47.3 *5*	D+Q	
		3736.69	3-	5903.7	39.0 *5*		
		0	0+	9639.6	1.5		
9668.71	3-	7694.15	3-	1974.5	0.65 *13*		
		7532.26	2-	2136.4	1.83 *15*		
		7446.23	(3,4)+	2222.4	0.68 *11*		
		7113.73	4-	2554.9	26.9 *7*		
		6908.70	2+	2759.9	0.67 *14*		
		6750.41	2-	2918.2	2.06 *18*		
		6285.15	3-	3383.4	44.4 *6*		
		6025.47	2-	3643.1	3.0 *3*		
		4491.44	5-	5176.9	3.00 *10*		
		3904.38	2+	5763.9	3.6 *2*		
		3736.69	3-	5931.6	13.2 *6*		
9779.49	3	8748.20	2+	1031.3	3.4 *3*		
		8678.29	4+	1101.2	3.3 *4*		
		8578.80	2+	1200.7	5.0 *3*		
		8134.76	(2-,3,4+)	1644.7	2.7 *2*		
		7928.42	4+	1851.0	5.3 *3*		
		7872.18	2+	1907.3	5.7 *5*		
		7561.18	3+	2218.2	18.9 *8*		
		7466.37	2+	2313.1	3.0		
		6908.70	2+	2870.7	4.2 *5*		
		6582.54	3-	3196.8	1.5 *4*		
		6542.78	4+	3236.6	1.3 *3*		
		6507.84	4+	3271.5	0.7 *2*		
		6029.71	3+	3749.6	1.1		
		5629.43	2+	4149.8	2.0 *2*		
		5613.53	4-	4165.7	19.9 *8*		
		5278.81	4+	4500.4	5.4 *4*		
		5248.81	2+	4530.4	0.7 *2*		

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ[†]	I_γ[‡]	Mult.	δ
		3904.38	2+	5874.7	14.6 *9*		
		3736.69	3-	6042.3	5.4 *6*		
9785.3	(1,2+)	7300.74	0+	2484.5	2.2		
		6908.70	2+	2876.5	0.7		
		3904.38	2+	5880.5	2.5		
		3352.62	0+	6432.1	9.6		
		0	0+	9784.0	85		
9865.15	1	8439.0	0+	1426.1	0.18 *5*		
		8091.61	2+	1773.5	0.73 *8*		
		7872.18	2+	1992.9	0.21 *3*		
		7701.8	0+	2163.3	0.53 *18*		
		7466.37	2+	2398.7	0.41 *6*		
		7300.74	0+	2564.3	3.2 *2*		
		7277.82	(2,3)+	2587.2	0.20 *7*		
		6950.49	1-	2914.6	0.32 *4*		
		6908.70	2+	2956.3	1.10 *10*		
		6750.41	2-	3114.6	0.21 *2*		
		5902.63	1-	3962.3	0.35 *4*		
		5629.43	2+	4235.5	0.41 *7*		
		5248.81	2+	4616.1	0.25 *3*		
		5211.7	0+	4653.2	0.4		
		3904.38	2+	5960.3	5.1 *2*		
		3352.62	0+	6512.0	15.0 *5*		
		0	0+	9863.8[g]	71.4 *12*		
9869.3	1+	7701.8	0+	2167.4	0.8		
		7300.74	0+	2568.5	2.3		
		6908.70	2+	2960.5	0.9		
		5248.81	2+	4620.2	0.8		
		5211.7	0+	4657.3	0.6		
		3904.38	2+	5964.4	5.6		
		3352.62	0+	6516.1	13		
		0	0+	9868.0	76		
9954.00	4+	8373.94	4+	1580.0	3.8 *3*		
		6931.29	3-	3022.6	3.0 *3*		
		6582.54	3-	3371.3	1.2 *3*		
		6542.78	4+	3411.1	10.6 *6*		
		6507.84	4+	3446.0	4.2 *2*		
		5613.53	4-	4340.2	4.8 *4*		
		5278.81	4+	4674.9	58.2 *17*		
		4491.44	5-	5462.2	2.7 *4*		
		3736.69	3-	6216.8	6.5 *6*		
10040.54	(2-,3-)	8764.18	3-	1276.3	5.4 *7*		
		8484.02	0+	1556.5	1.8 *3*		
		8323.16	(1-,2+)	1717.3	51.7 *10*		
		7623.11	(2-,3,4+)	2417.4	2.3 *3*		
		7532.26	2-	2508.2	0.93 *18*		
		7277.82	(2,3)+	2762.6	8.3 *3*		
		7113.73	4-	2926.7	4.4 *3*		
		6950.49	1-	3089.9	6.6 *6*		
		6582.54	3-	3457.8	1.4 *2*		
		6025.47	2-	4014.9	2.0 *2*		
		5902.63	1-	4137.7	13.6 *6*		
		3736.69	3-	6303.3	2.0 *2*		
10049.38	4-	9031.9	4-	1017.5	11.5 *5*		
		8187.69		1861.6	0.51 *5*		
		7769.4	(3,4,5)-	2279.9	2.37 *14*		
		7239.07	(3-,4,5-)	2810.2	0.76 *13*		
		7113.73	4-	2935.5	14.0 *4*		
		6582.54	3-	3466.7	7.3 *3*		

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		6285.15	3-	3764.0	1.26 *9*		
		6025.47	2-	4023.7	1.30 *10*		
		5613.53	4-	4435.6	0.95 *9*		
		4491.44	5-	5557.5	16.3 *4*		
		3736.69	3-	6312.2	43.7 *9*		
10262.53	3-	7623.11	(2-,3,4+)	2639.3	1.4 *2*		
		7466.37	2+	2796.1	15.6 *9*		
		7446.23	(3,4)+	2816.2	4.7 *4*		
		7113.73	4-	3148.7	1.4 *3*		
		6582.54	3-	3679.8	4.1 *3*		
		6029.71	3+	4232.6	16.1 *13*		
		5902.63	1-	4359.7	2.7 *4*		
		5629.43	2+	4632.8	2.9 *4*		
		5248.81	2+	5013.4	3.6 *4*		
		3904.38	2+	6357.6	36.0 *10*		
		3736.69	3-	6525.3	11.5 *10*		
10318.8	1+	7701.8	0+	2616.9	0.71 *7*		
		6950.49	1-	3368.2	0.41 *7*		
		5629.43	2+	4689.1	0.27 *7*		
		5211.7	0+	5106.8	0.77 *6*		
		3904.38	2+	6413.9	3.4 *2*		
		3352.62	0+	6965.5	11.9 *4*		
		0	0+	10317.4[h]	82.5 *7*	D[h]	
10415.06	3	7694.15	3-	2720.8	0.4 *2*		
		7623.11	(2-,3,4+)	2791.8	16.7 *5*		
		7561.18	3+	2853.8	1.13 *11*		
		7466.37	2+	2948.6	5.9 *2*		
		7446.23	(3,4)+	2968.7	17.4 *4*		
		7277.82	(2,3)+	3137.1	0.88 *14*		
		7113.73	4-	3301.2	1.57 *17*		
		6931.29	3-	3483.6	4.0 *2*		
		6908.70	2+	3506.2	15.7 *4*		
		6750.41	2-	3664.5	2.50 *10*		
		6582.54	3-	3832.3	1.34 *14*		
		6507.84	4+	3907.0	1.02 *16*		
		6285.15	3-	4129.7	0.36 *9*		
		6025.47	2-	4389.3	5.9 *3*		
		5629.43	2+	4785.3	0.81 *6*		
		5613.53	4-	4801.2	6.9 *3*		
		5278.81	4+	5135.9	2.7 *2*		
		5248.81	2+	5165.9	1.69 *17*		
		3904.38	2+	6510.1	3.5 *3*		
		3736.69	3-	6677.8	7.1 *4*		
10639.07	(3-,4,5-)	8134.76	(2-,3,4+)	2504.2	1.3 *2*		
		7113.73	4-	3525.2	4.0 *3*		
		6931.29	3-	3707.6	42.1 *12*		
		6582.54	3-	4056.3	1.6 *2*		
		6542.78	4+	4096.1	2.90 *10*		
		6507.84	4+	4131.0	4.0 *2*		
		5613.53	4-	5025.2	13.6 *6*		
		5278.81	4+	5359.9	4.4 *4*		
		4491.44	5-	6147.1	3.6 *3*		
		3736.69	3-	6901.7	22.5 *10*		
10699.50	3	8373.94	4+	2325.5	1.01 *14*		
		8091.61	2+	2607.8	0.72 *9*		
		7532.26	2-	3167.1	1.01 *16*		
		7466.37	2+	3233.0	0.9 *2*		
		7446.23	(3,4)+	3253.1	0.92 *15*		

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γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
		6908.70	2+	3790.6	2.6 *2*		
		6542.78	4+	4156.5	2.0 *2*		
		6285.15	3-	4414.1	1.4 *2*		
		6029.71	3+	4669.5	3.8 *3*		
		5629.43	2+	5069.7	5.5 *3*		
		5613.53	4-	5085.6	2.0 *2*		
		5278.81	4+	5420.3	9.2 *5*		
		3904.38	2+	6794.5	51.3 *16*		
		3736.69	3-	6962.2	8.0 *17*		
10737.7	1-	7694.15	3-	3043.4	9.2 *17*		
		6908.70	2+	3828.8	4.3 *14*		
		6285.15	3-	4452.3	7.8 *13*		
		0	0+	10736.2	55 *3*		
10747.8	4+	5629.43	2+	5118.0	12.5 *9*		
		3904.38	2+	6842.8	84.3 *10*		
		3736.69	3-	7010.5	3.2 *6*		
10770.2	(1+)	7113.73	4-	3656.3	3.3 *7*		
		6908.70	2+	3861.3	6.0 *7*		
		5248.81	2+	5521.0	42 *2*		
		0	0+	10768.6	32 *2*		
10910.0		3736.69	3-	7172.6	100		
10921.1		6025.47	2-	4895.3	10		
		5278.81	4+	5641.9	50		
10956.0	(3-,4+,5-)	8187.69		2768.2	5		
		7481		3474.8	10		
		7446.23	(3,4)+	3509.6	<5		
		5902.63	1-	5053.0	10		
		5613.53	4-	5342.1	8		
		5278.81	4+	5676.8	44		
		3736.69	3-	7218.6	25		
10988.0	2-	8978		2010.0	5		
		6908.70	2+	4079.1	5		
		6285.15	3-	4702.6	10		
		5629.43	2+	5358.2	10		
		3904.38	2+	7083.0	40		
		3736.69	3-	7250.6	35		
10994.7	(1-)	5278.81	4+	5715.5			
		5248.81	2+	5745.5			
		3736.69	3-	7257.3			
11011.0	3-	8338.0		2672.9	12 *3*		
		7976		3034.9	<3		
		7676.6	6+	3334.3	7 *2*		
		7300.74	0+	3710.1	<3		
		6931.29	3-	4079.5	<3		
		6029.71	3+	4981.0	<3		
		4491.44	5-	6519.0	45 *3*		
		3904.38	2+	7105.9	<3		
		3736.69	3-	7273.6	13		
		0	0+	11009.4	6		
11042.0	2+	3904.38	2+	7136.9			
		3736.69	3-	7304.6			
11070.0	(3)	5613.53	4-	5456.1	5		
		5278.81	4+	5790.7	10		
		5248.81	2+	5820.7	10		
		3904.38	2+	7164.9	65		
		3736.69	3-	7332.6	10		
11080		0	0+	11078			
12038		0	0+	12036			
12049		0	0+	12047			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.	δ
12068		0	0+	12066			
12074		0	0+	12072			
12099		0	0+	12097			
12111		0	0+	12109			
12204		0	0+	12202			
12334		0	0+	12332			
12423		0	0+	12421			
12604		0	0+	12602			
12647		3352.62	0+	9293			
12668		3352.62	0+	9314			
		0	0+	12666			
12688		0	0+	12686			
12875		3352.62	0+	9521			
		0	0+	12873			
12980		0	0+	12978			
12996		3352.62	0+	9642			
13086		0	0+	13084			
13113		3352.62	0+	9759			
		0	0+	13111			
13194		3352.62	0+	9840			
		0	0+	13192			
13203		0	0+	13201			
13289		3352.62	0+	9935			
		0	0+	13287			
13822		0	0+	13819			
13913		3352.62	0+	10559			
		0	0+	13910			
13993		3352.62	0+	10639			
		0	0+	13990			
18260		0	0+	18256		D	
18680		0	0+	18675		D	
19070		0	0+	19065		D	
19450		0	0+	19445		D	
19850		0	0+	19845		D	
20130		0	0+	20125			
20430		0	0+	20424		D	
20650		0	0+	20644		D	
20940		0	0+	20934		D	
21490		0	0+	21484			
21690		0	0+	21684			
22060		0	0+	22053			

† Level-energy differences, with recoil correction removed.
‡ Weighted average from 1990Ki07 and 1988Sc23.
[a] From 1963Le08.
[b] From 1988Sc23. 30% *20* γ-branching undetermined in 1990Ki07.
[c] For 3323.9+3324.7.
[d] For 3977.7+3978.4.
[e] For 5321.9+5322.7.
[f] For 9225.6+9226.3.
[g] Γ_γ=1.06 eV *15* (1988Al16).
[h] Γ_γ=5.8 eV *8* (1988Al16).

^{39}K(p,p),(p,α):resonances 1990Bu02,1987WaZI,1970De30

Jπ(^{39}K g.s.)=3/2+.
Other main reference: 1974Na09.
Most resonances decay to g.s. of ^{39}K in (p,p) and g.s. of ^{36}Ar in (p,α).
See ^{39}K(p,γ), ^{36}Ar(α,γ):resonances, and ^{40}Ca(p,pα),(p,2p):resonances datasets for additional resonances observed in those reaction.
All data are from (p,p$_0$) or (p,α_0) channels, with the exception of five resonances from 1969Va14 above 6 MeV which are from p$_1$ and p$_4$ channels.
1990Bu02: E=2.4-4.0 MeV. Measured $\sigma(\theta)$, for a total of 30 resonances from E(p)(lab)=2389.1 to 3998.2, all with Jπ=2+. FWHM=0.45 keV. Deduced widths and other relevant parameters.
1983Sh33 (same group as 1990Bu02): E=3.192-3.224 MeV. Measured $\sigma(\theta)$. Also (pol p,α) for E=3212 keV.
1987WaZI (from the same lab as 1990Bu02): E=1.9-4.0 MeV. Measured $\sigma(\theta)$. A total of 248 resonances reported, fifty of which were assigned 2+. Relevant resonance parameters for proton and α decay of these resonances are given. Only the widths are quoted here. The uncertainty is assigned by the evaluators as 0.5 keV based on overall FWHM=450 eV. The actual uncertainty may be lower than this for strong and well-resolved peaks.
1970De30: E=1.03-3.23 MeV. Measured $\sigma(\theta)$. A total of 34 resonances reported between E(p)(lab)=1102.5 and 2983.
1974Na09: (p,α) E=3.05-4.20 MeV. Measured $\sigma(\theta)$.
1969Va14: E=6.28-6.73 MeV. Five resonances reported between E(p)(lab)=6350 and 6660 corresponding to p$_1$ and p$_4$ channels.

^{40}Ca Levels

E(level)[†]	Jπ[‡]	L[e]	(2J+1)Γ_p^2/Γ (keV)[e]	Comments
9402.9 *14*[&]	2-[&]	1	0.7	E(p)(lab)=1102.5 *10*.
9430.1 *14*[&]	1-[&]	1	0.7	E(p)(lab)=1130.4 *10*.
9452.6 *14*[&]	(2,3)-[&]	1	0.6	E(p)(lab)=1153.4 *10*.
9535.0 *14*[&]	1-[&]	1	1.2	E(p)(lab)=1237.9 *10*.
9601.0 *14*[&]	3-[&]	1	3.4[f]	E(p)(lab)=1305.6 *10*.
9602.5 *14*[&]	1-[&]	1	3.4[f]	E(p)(lab)=1307.2 *10*.
9666 *2*[&]	($\leq$ 3)-[&]	1	1.8	E(p)(lab)=1372.4 *15*.
9799 *2*[&]	($\leq$ 3)-[&]	1	1.0	E(p)(lab)=1509 *2*.
9850 *2*[&]	($\leq$ 3)-[&]	1	1.7	E(p)(lab)=1561 *2*.
10199.1 *5*[a]	(1-)[a]	1	0.8	E(p)(lab)=1919.1 *5*, Γ_p=1.6 keV (1987WaZI). Jπ: 2 is also possible (1987WaZI).
10265 *2*[&]	1-[&]	1	2.8	E(p)(lab)=1987 *2*.
10275.1 *5*	(1-)			E(p)(lab)=1997.0 *5*, Γ_p=1.6 keV. Jπ: 2 is also possible (1987WaZI).
10280 *2*[&]	1-[&]	1	3.4	E(level): may be the same level as 10275. E(p)(lab)=2002 *2* (1970De30); this resonance may be the same as 1997 in 1987WaZI.
10333.7 *5*	(3-)			E(p)(lab)=2057.1 *5*, Γ_p=0.11 keV, Γ_α=0.001 keV. Jπ: 1 is also possible (1987WaZI).
10362.6 *5*	1-			E(p)(lab)=2086.8 *5*, Γ_p=0.60 keV, Γ_α=0.0030 keV.
10364.6 *5*[a]	1-[a]	1	27	E(p)(lab)=2088.8 *5*, Γ_p=1.1 keV, Γ_α=0.0050 keV (1987WaZI). Jπ: from 1987WaZI. Other: 3- in 1970De30.
10376.6 *5*	1-			E(p)(lab)=2101.1 *5*, Γ_p=0.60 keV, Γ_α=0.0020 keV.
10420.2 *5*	1-			E(p)(lab)=2145.8 *5*, Γ_p=0.50 keV, Γ_α=0.0028 keV.
10443.4 *5*	2-			E(p)(lab)=2169.6 *5*, Γ_p=4.0 keV.
10446.8 *5*[a]	1-[a]	1	3.1	E(p)(lab)=2173.1 *5*, Γ_p=0.15 keV, Γ_α=0.001 keV (1987WaZI). Other E(p)(lab)==2174 *2* (1970De30). Jπ: from 1987WaZI. Other: 3- (1970De30).
10516.3 *5*	1-			E(p)(lab)=2244.4 *5*, Γ_p=1.2 keV, Γ_α=0.010 keV.
10517.2 *5*	1(+)			E(p)(lab)=2245.3 *5*, Γ_p=0.30 keV.
10529.6 *5*	(1+)			E(p)(lab)=2258.0 *5*, Γ_p=0.40 keV. Jπ: 0 is also possible (1987WaZI).
10541.5 *5*[c]	0+			E(p)(lab)=2270.3 *5*, Γ_p=0.16 keV, Γ_α=0.025 keV.
10596.2 *5*	3-			E(p)(lab)=2326.4 *5*, Γ_p=0.15 keV, Γ_α=0.0050 keV.
10598.4 *5*	(1+)			E(p)(lab)=2328.6 *5*, Γ_p=0.20 keV. Jπ: 0 is also possible (1987WaZI).
10607.4 *5*	0(+)			E(p)(lab)=2337.8 *5*, Γ_p=0.20 keV.
10618.6 *5*	2-			E(p)(lab)=2349.3 *5*, Γ_p=3.5 keV.
10621.4 *5*[ac]	0+[a]		15	Jπ: from 1987WaZI. Other: 1- (1970De30).

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^{40}Ca Levels (continued)

E(level)[†]	Jπ[‡]	L[e]	(2J+1)Γ_p^2/Γ (keV)[e]	Comments
				E(p)(lab)=2352.2 *5*, Γ_p=0.030 keV, Γ_α=0.0080 keV (1987WaZI). Other: E(p)=2354 *3* (1970De30).
10633.6 *5*	(1-)			E(p)(lab)=2364.7 *5*, Γ_p=1.1 keV, Γ_α=0.0015 keV. Jπ: 3 is also possible (1987WaZI).
10655.9 *5*	(1-)			E(p)(lab)=2387.6 *5*, Γ_p=0.59 keV, Γ_α=0.0050 keV. Jπ: 3 is also possible (1987WaZI).
10657.4 *5*[#]	2+[#]	0	1.2	E(p)(lab)=2389.1 *5* (1990Bu02), 2390 *3* (1970De30). Γ_p=0.350 keV, Γ_α=0.004 keV.
10666.4 *5*[a]	2-[a]	1	17	Jπ: from 1987WaZI, 1- in 1970De30. E(p)(lab)=2398.4 *5*, Γ_p=2.0 keV (1987WaZI).
10675.4 *5*[a]	1-[a]	1	0.5	E(p)(lab)=2407.6 *5*, Γ_p=1.5 keV, Γ_α=0.060 keV (1987WaZI).
10692.9 *5*[a]	1+[a]	0	0.7	Jπ: from 1987WaZI, (1,2)+ in 1970De30. E(p)(lab)=2425.5 *5*, Γ_p=1.1 keV (1987WaZI).
10700.9 *5*	0+			E(p)(lab)=2433.7 *5*, Γ_p=0.60 keV, Γ_α=0.001 keV.
10722.1 *5*	1+			E(p)(lab)=2455.5 *5*, Γ_p=1.1 keV,.
10740.1 *5*[a]	1-[a]	1	1.5	E(p)(lab)=2473.9 *5*, Γ_p=2.2 keV, Γ_α=0.0060 keV (1987WaZI).
10748.8 *5*	0+			E(p)(lab)=2482.9 *5*, Γ_p=0.30 keV, Γ_α=0.010 keV.
10772.1 *5*	(1+)			E(p)(lab)=2506.8 *5*, Γ_p=0.050 keV. Jπ: 2 is also possible (1987WaZI).
10778.2 *5*[#]	2+[#]			E(p)(lab)=2513.0 *5*, Γ_p=0.180 keV, Γ_α=0.004 keV.
10780.5 *5*[a]	3-[a]	1	35	Jπ: 1- in 1987WaZI; later corrected to 3- by the same group. Other 1- (1970De30). E(p)(lab)=2515.4 *5*, Γ_p=1.0 keV, Γ_α=0.010 keV (1987WaZI). Other: E(p)(lab)=2514 *3* (1970De30).
10783.1 *5*	(0-)			E(p)(lab)=2518.0 *5*, Γ_p=0.70 keV. Jπ: 1 is also possible (1987WaZI).
10802.6 *5*	0(+)			E(p)(lab)=2538.1 *5*, Γ_p=0.50 keV, Γ_α=0.20 keV.
10816.2 *5*[a]	2-[a]	1	13	Jπ: from 1987WaZI, (1-) in 1970De30. E(p)(lab)=2552.0 *5*, Γ_p=6.0 keV (1987WaZI).
10816.4 *5*	3+			E(p)(lab)=2552.2 *5*, Γ_p=0.50 keV.
10833.0 *5*	3(-)			E(p)(lab)=2569.2 *5*, Γ_p=0.025 keV, Γ_α=0.0009 keV.
10849.2 *5*	2-			E(p)(lab)=2585.8 *5*, Γ_p=11 keV.
10852.0 *5*[a]	(1-,2-)[a]	1	30	Jπ: (1-,2-) in 1987WaZI, 1- in 1970De30. E(p)(lab)=2588.7 *5*, Γ_p=2.5 keV (1987WaZI).
10861.3 *5*[#]	2+[#]			E(p)(lab)=2598.2 *5*, Γ_p=0.040 keV, Γ_α=0.005 keV.
10868.9 *5*	1-			E(p)(lab)=2606.0 *5*, Γ_p=26 keV, Γ_α=0.070 keV.
10869.5 *5*	0+			E(p)(lab)=2606.7 *5*, Γ_p=0.40 keV. Jπ: 2 is also possible (1987WaZI).
10873.7 *5*	1-			E(p)(lab)=2611.0 *5*, Γ_p=4.0 keV. Jπ: 3 is also possible (1987WaZI).
10899.1 *5*	1+			E(p)(lab)=2637.0 *5*, Γ_p=0.41 keV.
10914.6 *5*[a]	1-[a]	1	6.9	E(p)(lab)=2652.9 *5*, Γ_p=5.0 keV, Γ_α=0.040 keV (1987WaZI).
10915.6 *5*	3+			E(p)(lab)=2653.9 *5*, Γ_p=0.70 keV. Jπ: 1+,2+ in 1987WaZI; later corrected to 3+ by the same group.
10932.5 *5*[a]	1-[a]	1	15	E(p)(lab)=2671.3 *5*, Γ_p=2.0 keV, Γ_α=0.0080 keV (1987WaZI).
10933.2 *5*[b]	2-			E(p)(lab)=2672.0 *5*, Γ_p=0.10 keV.
10946.8 *5*[#]	2+[#]			E(p)(lab)=2685.9 *5*, Γ_p=0.215 keV, Γ_α=0.011 keV.
10950.7 *5*[a]	1-[a]	1	30	Jπ: from 1987WaZI, 1- in 1970De30. E(p)(lab)=2689.9 *5*, Γ_p=7.0 keV (1987WaZI).
10953.4 *5*	0(+)			E(p)(lab)=2692.7 *5*, Γ_p=0.20 keV, Γ_α=0.020 keV.
10988.5 *5*	2-			E(p)(lab)=2728.7 *5*, Γ_p=9.0 keV.
10989.2 *5*	(1+)			E(p)(lab)=2729.4 *5*, Γ_p=0.4 keV. Jπ: 0 is also possible (1987WaZI).
10998.7 *5*[a]	3-,1-[a]	1	20	Jπ: 3-,1- in 1987WaZI, (1-) in 1970De30. E(p)(lab)=2739.2 *5*, Γ_p=0.20 keV, Γ_α=0.0020 keV (1987WaZI). Other: E(p)=2735 *3* (1970De30).
11007.0 *5*[a]	1-[a]	1	2.1	Jπ: from 1987WaZI, (1,3)- in 1970De30. E(p)(lab)=2747.7 *5*, Γ_p=5.0 keV, Γ_α=0.010 keV (1987WaZI). Other: E(p)=2750 *3* (1970De30).

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^{40}Ca Levels (continued)

E(level)[†]	Jπ[‡]	L[e]	(2J+1)Γ_p^2/Γ (keV)[e]	Comments
11024.0 *5*[a]	3(-)[a]	1	0.7	Jπ: from 1987WaZI, 1- in 1970De30. E(p)(lab)=2765.1 *5*, Γ_p=0.10 keV, Γ_α=0.012 keV (1987WaZI).
11036.1 *5*	(1+)			E(p)(lab)=2777.5 *5*, Γ_p=0.10 keV. Jπ: 2 is also possible (1987WaZI).
11044.3 *5*[#]	2+[#]	0	1.0	E(p)(lab)=2785.9 (1990Bu02), 2789 *3* (1970De30). Γ_p=0.50 keV, Γ_α=0.002 keV.
11073.3 *5*	2+			E(p)(lab)=2815.7 *5*, Γ_p=0.66 keV, Γ_α=0.0006 keV.
11078.2 *5*	1-			E(p)(lab)=2820.7 *5*, Γ_p=1.2 keV, Γ_α=0.0040 keV.
11083.4 *5*	(1+)			E(p)(lab)=2826.1 *5*, Γ_p=0.35 keV. Jπ: 0,2 are also possible (1987WaZI).
11089.1 *5*	0(+)			E(p)(lab)=2831.9 *5*, Γ_p=0.10 keV, Γ_α=0.0060 keV.
11106.8 *5*[a]	1-[a]	1	5.2	Jπ: from 1987WaZI, 0- in 1970De30. E(p)(lab)=2850.1 *5*, Γ_p=3.9 keV (1987WaZI). Other: E(p)=2855 *3* (1970De30).
11118.8 *5*[#]	2+[#]			E(p)(lab)=2862.3 *5*, Γ_p=0.040 keV, Γ_α=0.006 keV.
11128.9 *5*	4+			E(p)(lab)=2872.7 *5*, Γ_p=0.11 keV, Γ_α=0.0014 keV.
11145.0 *5*	1(-)			E(p)(lab)=2889.2 *5*, Γ_p=0.20 keV, Γ_α=0.0020 keV.
11145.6 *5*	1+			E(p)(lab)=2889.8 *5*, Γ_p=0.20 keV.
11157.0 *5*	2-			E(p)(lab)=2901.5 *5*, Γ_p=48 keV.
11161.3 *5*	4(+)			E(p)(lab)=2905.9 *5*, Γ_p=0.040 keV, Γ_α=0.0008 keV.
11162.7 *5*	2+			E(p)(lab)=2907.4 *5*, Γ_p=3.5 keV.
11167.2 *5*	4+			E(p)(lab)=2912.0 *5*, Γ_p=0.080 keV, Γ_α=0.0030 keV.
11187.4 *5*	3-			E(p)(lab)=2932.7 *5*, Γ_p=1.4 keV, Γ_α=0.0016 keV.
11202.7 *5*	(2-)			E(p)(lab)=2948.4 *5*, Γ_p=6.0 keV. Jπ: 1,3 are also possible (1987WaZI).
11212.4 *5*[a]	3-[a]	1	175	E(p)(lab)=2958.4 *5*, Γ_p=2.8 keV, Γ_α=0.0014 keV (1987WaZI). Other: E(p)=2962 *3* (1970De30).
11217.6 *5*	4+			E(p)(lab)=2963.7 *5*, Γ_p=1.4 keV, Γ_α=0.001 keV.
11231.2 *5*[a]	2-[a]	1	3	Jπ: from 1987WaZI, (1,2,3)- in 1970De30. E(p)(lab)=2977.6 *5*, Γ_p=3.0 keV (1987WaZI). Other: E(p)=2972 *3* (1970De30).
11236 *3*[&]	1-[&]	1	11.7	E(p)(lab)=2983 *3* (1970De30); not reported by 1987WaZI.
11246.6 *5*	3-			E(p)(lab)=2993.4 *5*, Γ_p=0.080 keV, Γ_α=0.012 keV.
11255.7 *5*	1+			E(p)(lab)=3002.8 *5*, Γ_p=0.30 keV.
11260.6 *5*	(0-)			E(p)(lab)=3007.8 *5*, Γ_p=6.0 keV. Jπ: 1 is also possible (1987WaZI).
11264.2 *5*[#]	2+[#]			E(p)(lab)=3011.4 *5*, Γ_p=0.325 keV, Γ_α=0.016 keV.
11284.1 *5*	(2-)			E(p)(lab)=3032.0 *5*, Γ_p=0.60 keV. Jπ: 1 is also possible (1987WaZI).
11289.6 *5*	1+			E(p)(lab)=3037.5 *5*, Γ_p=1.0 keV.
11300.1 *5*	1+			E(p)(lab)=3048.3 *5*, Γ_p=0.40 keV.
11302.3 *5*	(1-)			E(p)(lab)=3050.6 *5*, Γ_p=1.2 keV. Jπ: 2 is also possible (1987WaZI).
11319.8 *5*	(0-)			E(p)(lab)=3068.5 *5*, Γ_p=1.8 keV. Jπ: 1 is also possible (1987WaZI).
11321.8 *5*[#]	2+[#]			E(p)(lab)=3070.5 *5*, Γ_p=0.475 keV, Γ_α=0.041 keV.
11329.1 *5*[b]	2+			E(p)(lab)=3078.1 *5*.
11330.5 *5*	1-			E(p)(lab)=3079.5 *5*, Γ_p=4.0 keV, Γ_α=0.030 keV.
11338.5 *5*	(1+)			E(p)(lab)=3087.7 *5*, Γ_p=0.20 keV. Jπ: 0,2 are also possible (1987WaZI).
11342.4 *5*	2-			E(p)(lab)=3091.7 *5*, Γ_p=40 keV.
11346.2 *5*	4(+)			E(p)(lab)=3095.6 *5*, Γ_p=0.020 keV, Γ_α=0.0005 keV.
11351.3 *5*	1+			E(p)(lab)=3100.8 *5*, Γ_p=0.80 keV.
11362.2 *5*	1+			E(p)(lab)=3112.0 *5*, Γ_p=1.2 keV.
11365.8 *5*[#c]	2+[#]			E(p)(lab)=3115.7 *5*, Γ_p=0.090 keV, Γ_α=0.100 keV.
11366.8 *5*	2-			E(p)(lab)=3116.7 *5*, Γ_p=4.4 keV.
11368.1 *5*	4(+)			E(p)(lab)=3118.0 *5*, Γ_p=0.020 keV, Γ_α=0.0014 keV.
11371.2 *5*	2+			E(p)(lab)=3121.2 *5*, Γ_p=1.4 keV, Γ_α=0.0040 keV.

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^{40}Ca Levels (continued)

E(level)[†]	Jπ[‡]	L[e]	$(2J+1)\Gamma_p^2/\Gamma$ (keV)[e]	Comments
11381.9 *5*[#]	2+[#]			E(p)(lab)=3132.2 *5*, Γ_p=2.500 keV, Γ_α=0.065 keV.
11392.8 *5*	1(-)			E(p)(lab)=3143.4 *5*, Γ_p=0.10 keV, Γ_α=0.0004 keV.
11404.0 *5*	1-			E(p)(lab)=3154.9 *5*, Γ_p=3.5 keV, Γ_α=0.0060 keV.
11406.8 *5*	1+			E(p)(lab)=3157.7 *5*, Γ_p=0.22 keV.
11414.6 *5*	4+			E(p)(lab)=3165.7 *5*, Γ_p=0.10 keV, Γ_α=0.0050 keV.
11420.1 *5*	3-			E(p)(lab)=3171.4 *5*, Γ_p=0.30 keV, Γ_α=0.0009 keV.
11432.5 *5*	1-			E(p)(lab)=3184.1 *5*, Γ_p=0.30 keV, Γ_α=0.0020 keV.
11436.6 *5*[#]	2+[#]			E(p)(lab)=3188.3 *5*, Γ_p=0.200 keV, Γ_α=0.015 keV.
11447.0 *5*	1-			E(p)(lab)=3199.0 *5*, Γ_p=5.0 keV, Γ_α=0.34 keV.
11451.2 *5*	1+			E(p)(lab)=3203.3 *5*, Γ_p=0.60 keV.
11455.2 *5*	3-			E(p)(lab)=3207.4 *5*, Γ_p=0.050 keV, Γ_α=0.010 keV.
11460.2 *5*[#]	2+[#]			E(p)(lab)=3212.5 *5*, Γ_p=1.030 keV, Γ_α=0.140 keV.
11464.9 *5*	2(+)			E(p)(lab)=3217.3 *5*, Γ_p=0.026 keV, Γ_α=0.10 keV.
11468.5 *5*	2-			E(p)(lab)=3221.0 *5*, Γ_p=0.40 keV.
11479.6 *5*	1+			E(p)(lab)=3232.4 *5*, Γ_p=0.30 keV.
11486.5 *5*[c]	0+			E(p)(lab)=3239.5 *5*, Γ_p=0.10 keV, Γ_α=0.0060 keV.
11489.4 *5*	1+			E(p)(lab)=3242.5 *5*, Γ_p=0.40 keV.
11514.4 *5*[#]	2+[#]			E(p)(lab)=3268.1 *5*, Γ_p=0.500 keV, Γ_α=0.115 keV.
11515.0 *5*	1(-)			E(p)(lab)=3268.7 *5*, Γ_p=4.2 keV, Γ_α=0.030 keV.
11518.8 *5*	2+			E(p)(lab)=3272.6 *5*, Γ_p=0.70 keV.
11537.7 *5*	2-			E(p)(lab)=3292.0 *5*, Γ_p=8.0 keV.
11542.0 *5*	2+			E(p)(lab)=3296.4 *5*, Γ_p=0.60 keV, Γ_α=0.017 keV.
11543.5 *5*	(1+)			E(p)(lab)=3297.9 *5*, Γ_p=0.90 keV. Jπ: 2 is also possible (1987WaZI).
11546.5 *5*	2-			E(p)(lab)=3301.0 *5*, Γ_p=18 keV.
11554.3 *5*	1-			E(p)(lab)=3309.0 *5*, Γ_p=35 keV, Γ_α=0.60 keV.
11558.9 *5*	(2+)			E(p)(lab)=3313.7 *5*, Γ_p=0.40 keV. Jπ: 1 is also possible (1987WaZI).
11563.3 *5*	(2-)			E(p)(lab)=3318.3 *5*, Γ_p=0.40 keV. Jπ: 1 is also possible (1987WaZI).
11577.7 *5*	2-			E(p)(lab)=3333.0 *5*, Γ_p=1.0 keV.
11577.8 *5*[#]	2+[#]			E(p)(lab)=3333.1 *5*, Γ_p=0.180 keV, Γ_α=0.045 keV.
11585.4 *5*	2-			E(p)(lab)=3340.9 *5*, Γ_p=0.15 keV.
11597.0 *5*	(2+)			E(p)(lab)=3352.8 *5*, Γ_p=0.30 keV. Jπ: 1 is also possible (1987WaZI).
11602.1 *5*	2+			E(p)(lab)=3358.0 *5*, Γ_p=0.30 keV.
11603.2 *5*[#]	2+[#]			E(p)(lab)=3359.1 *5*, Γ_p=0.250 keV, Γ_α=0.030 keV.
11605.1 *5*	1-			E(p)(lab)=3361.1 *5*, Γ_p=12 keV, Γ_α=1.0 keV.
11610.9 *5*	1-			E(p)(lab)=3367.1 *5*, Γ_p=0.70 keV, Γ_α=0.16 keV.
11613.8 *5*	(2-)			E(p)(lab)=3370.0 *5*, Γ_p=0.50 keV. Jπ: 1 is also possible (1987WaZI).
11628.3 *5*	(3+)			E(p)(lab)=3384.9 *5*, Γ_p=0.70 keV. Jπ: 2 is also possible (1987WaZI).
11628.9 *5*[#]	2+[#]			E(p)(lab)=3385.5 *5*, Γ_p=0.070 keV, Γ_α=0.015 keV.
11637.9 *5*[c]	1-			E(p)(lab)=3394.8 *5*, Γ_p=0.080 keV, Γ_α=0.010 keV.
11644.8 *5*	(2-)			E(p)(lab)=3401.8 *5*, Γ_p=0.60 keV. Jπ: 1 is also possible (1987WaZI).
11646.7 *5*[#]	2+[#]			E(p)(lab)=3403.8 *5*, Γ_p=0.600 keV, Γ_α=0.002 keV. Γ_p=0.20 in 1987WaZI.
11650.6 *5*	2(+)			E(p)(lab)=3407.8 *5*, Γ_p=0.10 keV, Γ_α=0.080 keV.
11652.0 *5*[b]	3-			E(p)(lab)=3409.2 *5*.
11653.3 *5*[#]	2+[#]			E(p)(lab)=3410.5 *5*, Γ_p=1.500 keV, Γ_α=0.090 keV.
11661.5 *5*[c]	1-			E(p)(lab)=3419.0 *5*, Γ_p=0.060 keV, Γ_α=1.5 keV.
11672.6 *5*	(2-)			E(p)(lab)=3430.4 *5*, Γ_p=0.20 keV. Jπ: 1 is also possible (1987WaZI).
11676.9 *5*[#]	2+[#]			E(p)(lab)=3434.7 *5*, Γ_p=0.180 keV, Γ_α=0.775 keV.
11687.3 *5*	(1+)			E(p)(lab)=3445.4 *5*, Γ_p=0.50 keV. Jπ: 0 is also possible (1987WaZI).

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^{40}Ca Levels (continued)

E(level)[†]	Jπ[‡]	L[e]	(2J+1)Γ_p^2/Γ (keV)[e]	Comments
11689.0 5	(2-)			E(p)(lab)=3447.2 5, Γ_p=0.60 keV. Jπ: 1 is also possible (1987WaZI).
11692.6 5	4(+)			E(p)(lab)=3450.9 5, Γ_p=0.012 keV, Γ_α=0.0090 keV.
11696.1 5	0(-)			E(p)(lab)=3454.5 5, Γ_p=0.60 keV.
11703.4 5	0+			E(p)(lab)=3461.9 5, Γ_p=4.5 keV, Γ_α=0.15 keV.
11704.4 5	2-			E(p)(lab)=3463.0 5, Γ_p=3.0 keV.
11707.6 5	1-			E(p)(lab)=3466.3 5, Γ_p=0.30 keV, Γ_α=0.0020 keV.
11713.4 5	1+			E(p)(lab)=3472.2 5, Γ_p=0.20 keV.
11715.5 5	2-			E(p)(lab)=3474.4 5, Γ_p=1.5 keV.
11721.0 5	1+			E(p)(lab)=3480.0 5, Γ_p=1.5 keV.
11723.9 5	3(-)			E(p)(lab)=3483.8 5, Γ_p=0.050 keV, Γ_α=0.010 keV.
11730.8 5	1(-)			E(p)(lab)=3490.4 5, Γ_p=0.64 keV, Γ_α=3.0 keV.
11730.9 5	1+			E(p)(lab)=3490.5 5, Γ_p=0.40 keV.
11738.6 5	2-			E(p)(lab)=3498.2 5, Γ_p=3.0 keV.
11742.6 5[#]	2+[#]			E(p)(lab)=3502.1 5, Γ_p=0.750 keV, Γ_α=0.320 keV.
11744.4 5	4+			E(p)(lab)=3504.8 5, Γ_p=0.050 keV, Γ_α=0.50 keV. Jπ: 2+ in 1987WaZI; later corrected to 4+ by the same group.
11749.3 5	1(-)			E(p)(lab)=3509.7 5, Γ_p=0.70 keV, Γ_α=2.5 keV.
11753.2 5[b]	2-			E(p)(lab)=3513.1 5.
11753.8 5	3-			E(p)(lab)=3513.7 5, Γ_p=0.30 keV, Γ_α=0.050 keV. Jπ: 1- in 1987WaZI, later corrected to 3- by the same group.
11757.1 5	1+			E(p)(lab)=3517.4 5, Γ_p=0.60 keV.
11767.8 5	2-			E(p)(lab)=3528.2 5, Γ_p=15 keV.
11782.4 5	3(-)			E(p)(lab)=3543.5 5, Γ_p=0.021 keV, Γ_α=0.020 keV.
11788.3 5[#]	2+[#]			E(p)(lab)=3549.0 5, Γ_p=2.200 keV, Γ_α=0.340 keV.
11792.2 5	1+			E(p)(lab)=3553.5 5, Γ_p=0.46 keV.
11799.0 5	4(+)			E(p)(lab)=3560.2 5, Γ_p=0.010 keV, Γ_α=0.17 keV.
11803.9 5[c]	0+			E(p)(lab)=3565.3 5, Γ_p=0.060 keV, Γ_α=0.20 keV.
11808.8 5	(1+)			E(p)(lab)=3570.2 5, Γ_p=1.1 keV. Jπ: 2 is also possible (1987WaZI).
11810.7 5[#]	2+[#]			E(p)(lab)=3572.0 5, Γ_p=0.770 keV, Γ_α=0.975 keV.
11811.4 5	3-			E(p)(lab)=3572.7 5, Γ_p=0.26 keV, Γ_α=0.0020 keV.
11820.4 5	3-			E(p)(lab)=3581.9 5, Γ_p=3.5 keV, Γ_α=0.030 keV. Jπ: 1- in 1987WaZI; later corrected to 3- by the same group.
11830.6 5[#c]	2+[#]			E(p)(lab)=3592.4 5, Γ_p=0.070 keV, Γ_α=0.230 keV.
11839.0 5	0+			E(p)(lab)=3601.0 5, Γ_p=1.0 keV, Γ_α=0.050 keV.
11843.9 5	1+			E(p)(lab)=3606.0 5, Γ_p=0.78 keV.
11855.6 5[#]	2+[#]			E(p)(lab)=3618.0 5, Γ_p=0.325 keV, Γ_α=0.060 keV.
11857.1 5	(1+)			E(p)(lab)=3619.6 5, Γ_p=1.3 keV. Jπ: 2 is also possible (1987WaZI).
11863.1 5	(3-)			E(p)(lab)=3625.7 5, Γ_p=0.41 keV, Γ_α=0.0080 keV. Jπ: 1 is also possible (1987WaZI).
11864.5 5	(0+)			E(p)(lab)=3627.2 5, Γ_p=1.6 keV. Jπ: 1,2 are also possible (1987WaZI).
11868.6 5	(4+)			E(p)(lab)=3631.4 5, Γ_p=0.030 keV, Γ_α=0.0020 keV. Jπ: 2 is also possible (1987WaZI).
11869.8 5[c]	3-			E(p)(lab)=3632.6 5, Γ_p=0.010 keV, Γ_α=0.030 keV. Jπ: 2+ in 1987WaZI, later corrected to 3- by the same group.
11872.0 5[#]	2+[#]			E(p)(lab)=3634.8 5, Γ_p=0.450 keV, Γ_α=0.420 keV.
11877.8 5	1-			E(p)(lab)=3640.8 5, Γ_p=0.30 keV, Γ_α=0.015 keV.
11884.3 5	1+			E(p)(lab)=3647.5 5, Γ_p=0.80 keV.
11888.1 5	4+			E(p)(lab)=3651.4 5, Γ_p=0.10 keV, Γ_α=0.025 keV.
11890.7 5	1-			E(p)(lab)=3654.0 5, Γ_p=20 keV.
11893.8 5	(2-)			E(p)(lab)=3657.2 5, Γ_p=1.0 keV. Jπ: 1 is also possible (1987WaZI).
11901.2 5	1+			E(p)(lab)=3664.8 5, Γ_p=0.70 keV.
11915.7 5	3-			E(p)(lab)=3679.7 5, Γ_p=1.0 keV, Γ_α=0.0040 keV.
11924.4 5[#]	2+[#]			E(p)(lab)=3688.6 5, Γ_p=2.200 keV, Γ_α=0.002 keV.

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^{40}Ca Levels (continued)

E(level)[†]	J^{π}[‡]	L[e]	$(2J+1)\Gamma_p^2/\Gamma$ (keV)[e]	Comments
11929.8 5	4(+)			E(p)(lab)=3694.2 5, Γ_p=0.030 keV, Γ_α=0.0015 keV.
11933.1 5	1-			E(p)(lab)=3697.5 5, Γ_p=16 keV, Γ_α=0.074 keV.
11934.8 5	1+			E(p)(lab)=3699.3 5, Γ_p=0.80 keV.
11937.1 5	2-			E(p)(lab)=3701.6 5, Γ_p=0.60 keV.
11940.2 5	1+			E(p)(lab)=3704.8 5, Γ_p=0.40 keV.
11942.6 5	3-			E(p)(lab)=3707.3 5, Γ_p=0.48 keV, Γ_α=0.0090 keV.
11944.8 5	1-			E(p)(lab)=3709.5 5, Γ_p=0.40 keV, Γ_α=0.0080 keV.
11948.2 5	0+			E(p)(lab)=3713.0 5, Γ_p=0.30 keV, Γ_α=0.010 keV.
11958.5 5	(2+)			E(p)(lab)=3723.6 5, Γ_p=1.0 keV, Γ_α=0.0050 keV.
				Jπ: 1 is also possible (1987WaZI).
11962.7 5	0+			E(p)(lab)=3727.9 5, Γ_p=0.30 keV, Γ_α=0.0060 keV.
11969.6 5	1+			E(p)(lab)=3735.0 5, Γ_p=0.80 keV.
11970.8 5[#]	2+[#]			E(p)(lab)=3736.2 5, Γ_p=0.240 keV, Γ_α=0.018 keV.
11974.9 5[c]	1-			E(p)(lab)=3740.4 5, Γ_p=0.040 keV, Γ_α=0.015 keV.
11983.1 5	(2-)			E(p)(lab)=3748.8 5, Γ_p=1.6 keV.
				Jπ: 1 is also possible (1987WaZI).
11986.9 5	3-			E(p)(lab)=3752.7 5, Γ_p=0.30 keV, Γ_α=0.080 keV.
11993.8 5	0-			E(p)(lab)=3759.8 5, Γ_p=3.0 keV.
12001.1 5	(2+)			E(p)(lab)=3767.3 5, Γ_p=1.0 keV, Γ_α=0.020 keV.
				Jπ: 1 is also possible (1987WaZI).
12007.2 5	1+			E(p)(lab)=3773.5 5, Γ_p=0.55 keV.
12010.2 5	2-			E(p)(lab)=3776.6 5, Γ_p=6.0 keV.
12012.0 5[c]	4+			E(p)(lab)=3778.5 5, Γ_p=0.010 keV, Γ_α=0.0006 keV.
12023.4 5	1+			E(p)(lab)=3790.2 5, Γ_p=0.90 keV.
12026.7 5	4+			E(p)(lab)=3793.5 5, Γ_p=0.20 keV, Γ_α=0.018 keV.
12033.6 5	3-			E(p)(lab)=3800.6 5, Γ_p=0.30 keV, Γ_α=0.0050 keV.
12047.5 5	2+			E(p)(lab)=3814.9 5, Γ_p=2.5 keV, Γ_α=0.15 keV.
12056.2 5	1-			E(p)(lab)=3823.8 5, Γ_p=2.0 keV.
12058.7 5	2+			E(p)(lab)=3826.4 5, Γ_p=1.1 keV, Γ_α=0.10 keV.
12067.1 5	2+			E(p)(lab)=3835.0 5, Γ_p=1.0 keV, Γ_α=0.15 keV.
12067.6 5	4+			E(p)(lab)=3835.5 5, Γ_p=1.1 keV, Γ_α=0.01 keV.
				Jπ: 2+ in 1987WaZI; later corrected to 4+ by the same group.
				Γ_a of 0.10 listed in 1987WaZI was later corrected to 0.01 by the same group.
12076.6 5[b]	2-			E(p)(lab)=3844.7 5, Γ_p=3.0 keV, Γ_α=0.070 keV.
12081.8 5	4(+)			E(p)(lab)=3850.1 5, Γ_p=0.020 keV, Γ_α=0.001 keV.
12085.9 5	4(+)			E(p)(lab)=3854.3 5, Γ_p=0.010 keV, Γ_α=0.001 keV.
12088.6 5	2-			E(p)(lab)=3857.0 5, Γ_p=10.0 keV.
12089.6 5	2+			E(p)(lab)=3858.0 5, Γ_p=4.2 keV, Γ_α=20 keV.
12092.9 5	4(+)			E(p)(lab)=3861.4 5, Γ_p=0.030 keV, Γ_α=0.030 keV.
12094.9 5	2+			E(p)(lab)=3863.5 5, Γ_p=9.0 keV, Γ_α=0.40 keV.
12105.8 5	4(+)			E(p)(lab)=3874.7 5, Γ_p=0.050 keV, Γ_α=0.040 keV.
12110.5 5	2+			E(p)(lab)=3879.5 5, Γ_p=2.0 keV.
12114.9 5	3-			E(p)(lab)=3884.0 5, Γ_p=0.60 keV, Γ_α=0.18 keV.
12125.7 5	(3+)			E(p)(lab)=3895.1 5, Γ_p=1.0 keV.
				Jπ: 2 is also possible (1987WaZI).
12132.5 5	(4+)			E(p)(lab)=3902.1 5, Γ_p=0.060 keV, Γ_α=0.070 keV.
				Jπ: 2 is also possible (1987WaZI).
12134.7 5	(4+)			E(p)(lab)=3904.3 5, Γ_p=0.10 keV, Γ_α=0.0030 keV.
				Jπ: 2 is also possible (1987WaZI).
12141.1 5[#]	2+[#]			E(p)(lab)=3910.8 5, Γ_p=1.00 keV, Γ_α=0.240 keV.
12152.1 5	4+			E(p)(lab)=3922.2 5, Γ_p=0.33 keV, Γ_α=0.025 keV.
12157.8 5	4(+)			E(p)(lab)=3927.8 5, Γ_p=0.080 keV, Γ_α=0.040 keV.
12159.3 5	4(+)			E(p)(lab)=3929.5 5, Γ_p=0.080 keV, Γ_α=0.0030 keV.
12177.5 5	1(-)			E(p)(lab)=3948.2 5, Γ_p=0.20 keV, Γ_α=0.020 keV.
12180.0 5	2+			E(p)(lab)=3950.8 5, Γ_p=1.4 keV, Γ_α=0.10 keV.
12184.3 5	2-			E(p)(lab)=3955.2 5, Γ_p=2.0 keV.
12192.6 5[#]	2+[#]			E(p)(lab)=3963.6 5, Γ_p=1.00 keV, Γ_α=0.240 keV.

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^{40}Ca Levels (continued)

E(level)[†]	Jπ[‡]	L[e]	$(2J+1)\Gamma_p^2/\Gamma$ (keV)[e]	Comments
12196.1 *5*	1(-)			E(p)(lab)=3967.3 *5*, Γ_p=0.80 keV, Γ_α=0.15 keV.
12201.0 *5*	3-			E(p)(lab)=3972.3 *5*, Γ_p=2.0 keV, Γ_α=0.080 keV.
12209.1 *5*	0-			E(p)(lab)=3980.6 *5*, Γ_p=1.0 keV.
12211.7 *5*[c]	4+			E(p)(lab)=3983.3 *5*, Γ_p=0.020 keV, Γ_α=0.0090 keV.
12217.5 *5*	1+			E(p)(lab)=3989.2 *5*, Γ_p=1.5 keV.
12224.1 *5*	1-			E(p)(lab)=3996.0 *5*, Γ_p=1.4 keV, Γ_α=0.060 keV.
12226.3 *5*[#]	2+[#]			E(p)(lab)=3998.2 *5*, Γ_p=0.425 keV, Γ_α=0.009 keV.
12237.6 *5*	1+			E(p)(lab)=4009.8 *5*, Γ_p=2.0 keV.
12243.8 *5*	4+			E(p)(lab)=4016.2 *5*, Γ_p=0.020 keV, Γ_α=0.010 keV.
12245.1 *5*	1-			E(p)(lab)=4017.5 *5*, Γ_p=1.0 keV, Γ_α=1.0 keV.
12256 *4*[d]				E(p)(lab)=4029 *4*; Γ=5.5 keV.
12270 *4*[d]	(2+)			E(p)(lab)=4043 *4*; Γ=5.8 keV.
12280 *4*[d]				E(p)(lab)=4053 *4*; Γ=4.2 keV.
12292 *4*[d]				E(p)(lab)=4066 *4*; Γ=4.0 keV.
12299 *4*[d]	(2+)			E(p)(lab)=4073 *4*; Γ=4.0 keV.
12305 *4*[d]	(1-)			E(p)(lab)=4079 *4*; Γ=6.7 keV.
12331 *4*[d]	2+			E(p)(lab)=4106 *4*; Γ=7.3 keV.
12348 *4*[d]				E(p)(lab)=4123 *4*; Γ=6.0 keV.
12357 *4*[d]	(3-,1-)			E(p)(lab)=4132 *4*; Γ=5.5 keV.
12368 *4*[d]				E(p)(lab)=4143 *4*; Γ=6.7 keV.
12376 *4*[d]				E(p)(lab)=4152 *4*; Γ=5.9 keV.
12381 *4*[d]				E(p)(lab)=4157 *4*; Γ=4.0 keV.
12399 *4*[d]	(2+,1-)			E(p)(lab)=4175 *4*; Γ=6.7 keV.
12406 *4*[d]				E(p)(lab)=4182 *4*; Γ=3.5 keV.
12411 *4*[d]				E(p)(lab)=4188 *4*; Γ=4.0 keV.
12419 *4*[d]				E(p)(lab)=4195 *4*; Γ=5.4 keV.
12425 *4*[d]				E(p)(lab)=4202 *4*; Γ=6.4 keV.
14370[@]				E(p)(lab)=6350.
14460[@]				E(p)(lab)=6440.
14530[@]				E(p)(lab)=6520.
14600[@]				E(p)(lab)=6590.
14680[@]				E(p)(lab)=6660.

† E(p)(c.m.)+S(p)(^{40}Ca), where S(p)=8328.23 *9* (2003Au03), E(p)(c.m.)≈E(p)(lab)(39/40). The E(p)(lab) values are from 1987WaZI, unless otherwise stated, and are given under comments. The proton and α Γ parameters are given under comments. For other relevant parameters see 1987WaZI and 1990Bu02. Resonances listed at E(p)(lab)=2740.6 and 2764.6 by 1987WaZI were later deleted by the by the same group. Uncertainty for E(p)(lab) is assigned here as 0.5 keV (same as FWHM), but the relative uncertainty is expected to be much smaller, probably ≈0.1 keV.

‡ From 1987WaZI, unless otherwise stated. When Jπ given in parentheses, other less likely spin(s) which give similar fits are given in comments. When parity appears in parentheses, resonance is too weak in (p,p) to determine parity unambiguously.

From 1990Bu02. See also 1987WaZI from the same group. The Γ_p and Γ_α values are also given in 1987WaZI.

@ From 1969Va14 only from p_1 and p_4 channels.

& From 1970De30.

a Resonance reported by 1970De30 also.

b Not listed in 1987WaZI, but added later by the same group.

c 1987WaZI state that resonance does not appear in (p,p_0). It probably corresponds to (p,p_1).

d From 1974Na09.

e From 1970De30.

f For 9602.5+9604.5.

^{39}K(d,n) 1969Fu01

Jπ(^{39}K g.s.)=3/2+.
1969Fu01: E=6 MeV; measured $\sigma(\theta)$, tof.
Others:.
1967Ba38: E=2.9-6.2 MeV. Measured $\sigma(\theta)$ for g.s.
2000El08: E=0.7-3.4 MeV. Measured yield from γ-ray data.

^{40}Ca Levels

E(level)†	Jπ‡	L	G_L#	Comments
0	0+	2	0.84	
3353	0+	(2)	≤0.09	
3737	3-	1+3	0.44 *3*	S: for L=3; 0.02 for L=1. S=0.02 for L=1, 0.50 *4* for L=3.
3904	2+	(2)	≤0.12	
4491	5-	3	0.93 *13*	S=0.68 *10*.
5614	4-	3	1.06 *11*	S=0.94.
5903	1-	1(+3)	0.02	S: ≤0.05 for L=3. S=0.05 for L=1.
6025	2-	1+3	0.12 *4*	S: for L=3; 0.037 for L=1. S=0.06 for L=1, 0.20 *7* for L=3.
6285	3-	1(+3)	0.43	S: ≤0.3 for L=3. S=0.49 for L=1, ≤0.3 for L=3.
6582	3-	1(+3)	0.14	S: ≤0.2 for L=3. S=0.16 for L=1, ≤0.2 for L=3.
6750	2-	1+3	0.33 *11*	S: for L=3; 0.034 for L=1. S=0.05 for L=1, 0.53 *18* for L=3.
6950	1-	1(+3)	0.17	S: ≤0.2 for L=3. S=0.45 for L=1.
7113	(3)-	1(+3)	0.18	S: ≤0.1 for L=3. S=0.21 for L=1, ≤0.1 for L=3. Jπ: 1- and 4- in Adopted Levels.
7532	(2)-	1(+3)	0.49	S: ≤0.1 for L=3. S=0.78 for L=1, ≤0.2 for L=3.
7658		3	1.50 *14*	E(level): doublet: 7655+7676. S=0.69 *7* for 7655, (4)-. $((2J_f+1)/(2J_i+1))$S=3.0 *3*.
7694	(3)-	1	0.05	S=0.82 *8*. $((2J_f+1)/(2J_i+1))$S=0.10.
7972		1	0.04	
8124		1+3	0.12 *4*	E(level): doublet: 8113+8135. S: for L=3; 0.025 for L=1. S=0.03 for L=1; 0.12 *4* for L=3.
8186		0		
8271	(0)-	1	0.08	S=0.64. Jπ: (≤3)- in Adopted Levels.
8371	(0)-	1	0.08	S=0.64. Jπ: (0,1,2)- in Adopted Levels.
8424	(2)-	1+3	0.36 *11*	S: for L=3; 0.01 for L=1. S=0.58 *18* for L=3. $((2J_f+1)/(2J_i+1))$S=0.02 for L=1; ; 0.72 *22* for L=3.
8551	(5)-	3	0.98 *12*	S=0.71 *9*. $((2J_f+1)/(2J_i+1))$S=1.96 *24*.
8664 *12*		1	0.14	
8757 *12*				
8860 *12*	(0)-			Jπ: (6,7,8)- in Adopted Levels.
8931 *12*		1	0.11	S=0.88.
8987 *12*				
9137 *12*		1	0.17	
9228 *12*		1	0.16	$((2J_f+1)/(2J_i+1))$S=0.32.
9408 *12*	(2)-	1	0.57	E(level): triplet: 9405+9412+9419.

Continued on next page (footnotes at end of table)

^{40}Ca Levels (continued)

E(level)†	Jπ‡	L	G_L#	Comments
				S=0.43. S=0.35 for 9404, (3)- level with L=1. $((2J_f+1)/(2J_i+1))$S=1.14 for 9404+9408.
9431 *12*	(1)-	1	0.22 *3*	E(level): doublet: 9430+9432. S=0.59. $((2J_f+1)/(2J_i+1))$S=0.44 *6* for 9433+9435.
9455 *12*		1	0.13	$((2J_f+1)/(2J_i+1))$S=0.26.
9533 *12*	(1)-	1	0.22	S=0.59. $((2J_f+1)/(2J_i+1))$S=0.44 for 9539+9540.
9601 *12*	(2)-	1	0.37	E(level): doublet: 9603+9605. S=0.59. Jπ: 1- and 3- in Adopted Levels.
9666 *12*		1	0.11	
10040 *12*	(0)-	1	0.05 *1*	S=0.44 *8*. $((2J_f+1)/(2J_i+1))$S=0.11 *2*. E(level): from 1969Fu01. Several levels near this energy in Adopted Levels

† Rounded-off values from Adopted Levels for levels below 8600.

‡ From Adopted Levels up to 7 MeV; from 1969Fu01 above this energy where many groups are unresolved and it is difficult to find corresponding levels in Adopted Levels.

Transition strength $G_L=((2J_f+1)/(2J_i+1))C^2S$, where J_f=spin of final state, J_i=target spin=3/2. The spectroscopic factors are given under comments. Uncertainty is less than 10%, when not stated. Absolute normalization uncertainty is 30%.

^{39}K(^{3}He,d),(^{3}He,dγ) 1966Er05,1967Se10,1973Te04

Jπ(^{39}K g.s.)=3/2+.
1966Er05: (^{3}He,d) E=12 MeV. Measured $\sigma(\theta)$; deduced L, S.
1967Se10: E=12,14,16 MeV. Measured $\sigma(\theta)$ at E=14 MeV.
1973Te04 (also 1971Te02,1970Te01): (^{3}He,dγ) E=18 MeV. Measured Eγ, Iγ, dγ coin.
1970Fo04: (^{3}He,d) E=11 MeV. Measured $\sigma(\theta)$; deduced L, S.
1971Ca05: (^{3}He,d) E=29.3 MeV. Measured $\sigma(\theta)$; deduced L, S.
1968Ba64: (^{3}He,d), (^{3}He,dγ) E=18 MeV. FWHM=60-80 keV for deuteron spectra. About 20 groups reported from (^{3}He,d) and 3 levels in (^{3}He,dγ).
1994Ve04: (^{3}He,d) E=25 MeV. Measured $\sigma(\theta)$ for g.s.

^{40}Ca Levels

E(level)[†]	J$^{\pi}$[‡]	L	(2J+1)S[#]	Comments
0	0+	2	6.5 *6*	
3353	0+	(2)	0.4 *2*	S: <8% of g.s. (1967Se10).
3736.8 *3*	3-	3	4.0 *4*	L: 1966Er05 give also L=l with (2J+1)S≈0.08.
3904.8 *4*	2+	(2)	<0.2	Strength<3% of g.s. (1967Se10).
4410[b]				E(level): this group reported only by 1968Ba64 is suspect (evaluators); not included in Adopted Levels.
4491.6 *5*	5-	3	9.8 *12*	
5213[&]				
5248[&]				
5278[&]				
5613.4 *7*	4-	3	8.2 *12*	
5903.9 *10*	1-	1	0.14 *3*	
6025.9 *6*	2-	3	1.5 *4*	L: 1967Se10 and 1966Er05 give L=l+3, with (2J+1)S=0.2 *1* for L=1.
6284.8 *7*	3-	1	3.6 *7*	L: 1967Se10 give L=1+3 with (2J+1)S≤0.7 for L=3.
6582.1 *6*	3-	1	1.3 *2*	
6751.1 *8*	2-	1	1.0 *1*	L: other: L=3, (2J+1)S=1.9 (1971Ca05).
6928.3 *25*				E(level): possibly a close doublet (2-3 keV apart) according to 1973Te04, since the Doppler shifts for the two γ's barely overlap. Level not reported in any other (^{3}He,d) experiment. $T_{1/2}$: 1652γ. Other: 210 fs *70* from 3190γ.
6952.8 *15*	1-	1	1.2 *3*	
7115.2 *7*	4-	1	1.6 *2*	
7531.2 *17*	2-	1	1.0	L: 1967Se10 give L=l+3 with (2J+1)S=4.0 for L=3.
7658.5 *17*[@]	4-	3[a]	6.6 *10*[a]	
7694.5 *8*[@]	3-	3[a]	6.5 *10*[a]	
8268 *4*	(0-)			E(level): from 1973Te04. Adopted Jπ=(≤3)-.
8358.1 *20*	(0-)			E(level): from 1973Te04. Adopted Jπ=(0,1,2)-.
8425.3 *20*	2-	3	3.7 *7*	E(level): according to 1973Te04 this level is strongly fed in (^{3}He,d); probably corresponds to 8435 *9* from 1967Se10. L: 1967Se10.
8460[b]				
8552.6 *20*	5-	3	11 *2*	
9140 *50*				E(level): from 1971Ca05 and 1968Ba64, presumably a multiplet.
9410 *50*				E(level): from 1971Ca05 and 1968Ba64, presumably a multiplet.
9700[b]				
10050[b]				
10380[b]				
11200[b]				

[†] The evaluators have used the best reference sources to determine as to which levels are populated in (^{3}He,d), and then match these with the precisely known levels from (^{3}He,dγ) (1973Te04). Weighted average taken from 1966Er05 and 1967Se10, when level energies are available from particle data only.
[‡] From Adopted Levels unless otherwise stated.
[#] Most papers quote S from (2J+1)S taking J from Adopted Levels. Values given here are (2J+1)S. Weighted averages have been taken of all available results.
[@] 7659+7694 doublet in (^{3}He,d) particle-transfer data.
[&] 0+, 2+, 4+ triplet with total strength <10% of g.s. (1967Se10).

[a] L=3 with almost equal strengths for both components (1966Er05). 1967Se10 give L=1 for both states with (2J+1)S=5.5 for 7659 and 5.8 for 7696 levels.
[b] From 1968Ba64 only.

$\gamma(^{40}Ca)$

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	I_γ	Comments
3736.8	3-	0	0+	3736.6 *3*	100	
3904.8	2+	0	0+	3904.6 *4*	100	
4491.6	5-	3736.8	3-	754.7 *2*	100	
5613.4	4-	4491.6	5-	1123.0 *8*	30	
		3736.8	3-	1876.5 *4*	70	
5903.9	1-	0	0+	5903.4 *10*	100	
6025.9	2-	3904.8	2+	2121.0 *6*	20	
		3736.8	3-	2289.0 *3*	80	
6284.8	3-	4491.6	5-	1793.1 *2*	70	
		3904.8	2+	2380.0 *5*	20	
		0	0+	6285	5	E_γ: from figure 2 of 1973Te04; not given in authors′ table I.
6582.1	3-	3736.8	3-	2845.1 *3*	100	
6751.1	2-	3904.8	2+	2848.4 *10*	15	
		3736.8	3-	3014.0 *3*	85	
6928.3		5278		1651.7 *4*	50	
		3736.8	3-	3190.0 *15*	50	
6952.8	1-	0	0+	6952.2 *15*	100	
7115.2	4-	5613.4	4-	1502	20	E_γ: from figure 2 of 1973Te04; not given authors′ table I.
		4491.6	5-	2623.2 *3*	20	
		3736.8	3-	3378.5 *3*	60	
7531.2	2-	5613.4	4-	1917.6 *10*	100	
7658.5	4-	5613.4	4-	2045.0 *10*	100	
7694.5	3-	3736.8	3-	3957.5 *5*	100	
8268	(0-)	6952.8	1-	1315	60	
		5903.9	1-	2364	40	
8358.1	(0-)	6952.8	1-	1405	>90	
8552.6	5-	4491.6	5-	4060.8 *15*	100	

^{40}Ca(γ,γ') 2002Ha13,1982Mo05

2002Ha13 (also 2001Ba66,2000Ha34,2000Zi04): E=9.9 MeV bremsstrahlung source. Measured Eγ, Iγ, $\gamma\gamma(\theta)$, strengths. Deduced widths.
1982Mo05 (also 1977SaYN): E=8.5, 11.3, 11.7 MeV bremsstrahlung source. Measured Eγ, $\gamma\gamma(\theta)$, strengths.
Data for selected levels.
1987Gu01: E=9603.9, 9864.6, 9868.8, 10321.0 keV from ^{39}K(p,γ) resonances. Measured σ, Eγ. Deduced widths for four levels.
1977La15: E=6.95 MeV from ^{19}F(p,$\alpha\gamma$); measured σ, $\gamma(\theta)$ for two levels at 6914 and 6954.
1968Me06: E=6.91, 6.95 MeV from ^{19}F(p,$\alpha\gamma$); measured σ, deduced spin and widths for 6910, 6950 levels.
1962Ra07, 1961Ec03: ^{39}K(p,γ) resonances as source to measure.
Absorption lineshapes for 9866, 9869 doublet.
1961Ec03: E=10.3 MeV from ^{39}K(p,γ) resonances as source. Deduced widths for 10.3 MeV level.
1961De22: E=35 MeV bremstrahlung source; measured $\sigma(\theta)$ for Eγ=17-23 MeV; deduced parameters for giant-dipole resonance.
Other:.
1999Pr01: E=58, 74 MeV. Measured $\sigma(\theta)$. Deduced electromagnetic polarizability.

^{40}Ca Levels

E(level)†	Jπ‡	T or Γ@	Γ_0#	Comments
0	0+			
3904.0 *1*	2+	29 fs *8*	0.016 *4*	S: 0.007 eV *3* (1982Mo05).
5249.6 *3*		99 fs *11*	0.0046 *5*	
5628.9 *2*	2+	32.6 fs *30*	0.0140 *13*	S: 0.007 eV *3* (1982Mo05).
5902.5 *2*	1-	13.9 fs *17*	0.030 *4*	S: 0.025 eV *5* (1982Mo05).
6421.2 *9*		17 fs *4*	0.027 *7*	S: 0.050 eV *6* (1982Mo05). Jπ: 2+ (1982Mo05); but not definitive in 2002Ha13.
6908.2 *1*	2+	2.08 fs *35*	0.221 *36*	S: 0.190 eV *20* (1982Mo05), 0.13 eV *6* (1977La15), 0.18 eV *3* (1968Me06).
6949.9 *7*	1-	0.90 fs *14*	0.49 *7*	S: 0.450 eV *20* (1982Mo05), 0.41 eV *8* (1977La15), 0.47 eV *6* (1968Me06).
7871.9 *1*	2+	2.6 fs *5*	0.176 *32*	S: 0.190 eV *17* (1982Mo05).
8091.5 *2*	2+	2.77 fs *28*	0.166 *16*	S: 0.150 eV *10* (1982Mo05).
8110.9 *6*	1	18 fs *7*	0.025 *9*	S: 0.012 eV *5* (1982Mo05). Jπ: 1(-) in Adopted Levels.
8578.7 *2*	2+	2.84 fs *28*	0.161 *13*	S: 0.094 eV *12* (1982Mo05).
8749.4 *2*	2+	5.2 fs *6*	0.088 *11*	S: 0.065 eV *12* (1982Mo05).
8982.5 *5*	2+	3.12 fs *35*	0.148 *15*	S: 0.054 eV *10* (1982Mo05).
9603.9		0.19 keV *5*	4.9 *18*	All data from 1987Gu01.
9866.0 *20*		0.100 keV *24*	3.6 *15*	E(level): from 1982Mo05. Other: 9864.6 (1987Gu01). $T_{1/2}$: from 1987Gu01. Other: 0.110 keV *30* (1962Ra07). Most of the Γ is ascribed to proton decay (1962Ra07). S: from 1982Mo05. Other: 1.36 eV *25* (1962Ra07). Γ_0/Γ=0.0122 (from Adopted Levels, gammas).
9868.9		0.90 keV *21*	0.80 *26*	E(level): from 1987Gu01. Γ from 1987Gu01. Other: 1.06 keV *20* (1962Ra07). Most of the width is ascribed to proton decay (1962Ra07). S: from 1962Ra07.
10318.0 *20*	1	26 eV *7*	5.5 *8*	E(level): from 1982Mo05. Other: 10321.0 (1987Gu01). Jπ=1+ in Adopted Levels. S: from 1982Mo05. Others: 6.6 eV *8* (1987Gu01), 3.60 eV *24* (1961Ec03). Γ from 1982Mo05. Others: 91 eV *15* (1987Gu01), 10.3 eV *17* (1961Ec03). Γ_γ=6.4 eV *9* (1982Mo05), 4.5 eV *6* (1961Ec03). Γ_p=20 eV *5* (1982Mo05), 5.8 eV *18* (1961Ec03). Γ_0/Γ=0.21 *2* (1982Mo05).
20×10^3				E(level): giant-dipole resonance (1961De22). Γ_γ/Γ=0.0053, 0.0058 (1961De22).

† From 2002Ha13, unless otherwise stated. Values available from 1982Mo05 are in general agreement with those from 2002Ha13.
‡ From 2002Ha13 and 1982Mo05.
\# In eV, from 2002Ha13, unless otherwise stated. Values available from 1982Mo05 are given under comments.

@ From 2002Ha13, assuming $\Gamma=\Gamma_0$, unless otherwise stated.

$\gamma(^{40}Ca)$

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ	Mult.
3904.0	2+	0	0+	3904.0 *1*	
5249.6		0	0+	5249.6 *3*	
5628.9	2+	0	0+	5628.9 *2*	
5902.5	1-	0	0+	5902.5 *2*	
6421.2		0	0+	6421.2 *9*	
6908.2	2+	0	0+	6908.2 *1*	
6949.9	1-	0	0+	6949.9 *7*	
7871.9	2+	0	0+	7871.9 *1*	
8091.5	2+	0	0+	8091.5 *2*	
8110.9	1	0	0+	8111.9 *6*	
8578.7	2+	0	0+	8578.7 *2*	
8749.4	2+	0	0+	8749.4 *2*	
8982.5	2+	0	0+	8982.5 *5*	E2
9603.9		0	0+	9603.9	
9866.0		0	0+	9866.0 *20*	
9868.9		0	0+	9868.9	
10318.0	1	0	0+	10318 *2*	

^{40}Ca(e,e′) 1982Bu05,1978Gr02,1970It01

Most measurements report $\sigma(\theta)$ distributions and deduce transition strengths for states excited in (e,e′).
Other main references: 1995Pe01, 1984Ha29, 1984Og01, 1980St17, 1979Gr09, 1974Na15, 1973Ha13, 1971Fa15, 1971He08, 1970It01, 1970St10, 1969Ei03, 1968Zi06, 1964Ho06, 1963Bl04, 1963Ba19, 1961Pe21, 1956He83, 1956Ha91.
1982Bu05 (also 1982BuZR): E=31-65 MeV. ΔE(level)=50.
1978Gr02 (also 1978Gr03,1977Gr26): E=31-67 MeV. ΔE(level)=30.
1970It01: E=183, 250 MeV. ΔE(level)=100.
1970Go10: E=44-54 MeV. ΔE(level)=200; giant resonances.
1995Pe01: E=28.4, 34.9, 45.7, 54.6, 56.5 MeV. Data for 8 M1 levels and 5 M2 levels from 9870 to 13670. ΔE(level)=10. The authors also quote data for 18 levels from Darmstadt group (R. Benz, Diploma thesis 1984; W. Gross, Diploma thesis 1981; both from Darmstadt).
1984Og01: E=70-200 MeV.
1984Ha29: E=81.6-380 MeV. 3352 level studied.
1980St17: E=39 MeV. ΔE(level)=35. Data for 10319 level.
1979Gr09: E=44, 50 MeV. ΔE(level)=5.
1974Na15: E=700-750 MeV. Measured electron-proton coin; deduced proton-separation energies.
1973Ha13: E=66-121 MeV.
1971Fa15: E=39-56 MeV.
1971He08: E=198, 250, 300 MeV.
1970St10, 1968St20: E=28-60 MeV. Data for 0+ state.
1969Ei03: E=20-60 MeV.
1968Zi06: E=282.8 MeV.
1964Ho06: E=80-190 MeV.
1963Bl04: E=120, 150, 180, 220 MeV.
1961Pe21: E=120, 150, 180 MeV.
1956He83: E=187 MeV. Data for 3730 level.
1956Ha91: E=183 MeV. Data for 3730+3900 level.
Others:.
(e,e′): 2001Di23, 1986De12, 1985Me05 (also 1984Me06), 1983De25, 1981Fr03, 1978Zi04, 1975To02, 1968Fr11, 1964We08, 1962Ed02.
(e,e): 1997Wi23, 1983Em01, 1979Si21, 1973Si15 (also 1971Si08, 1971SiYF).
(e,e′p) and (e,e′α): giant resonances deduced: 2001Di24, 2001Di23, 1998Ko20, 1995Di03, 1994Vo05, 1976Mo17, 1973Ca14, 1971Mo06.
(e,e′n): 1994Ta12.

^{40}Ca Levels

1963Bl04 give B(EL)(↓), these have been converted to B(EL)(↑).

E(level)	$J^{\pi\dagger}$	Comments
0	0+	
3350	0+	Monopole matrix element=0.025 fm^2 *4* (1978Gr02), 0.039 *11* (1968St20). Form factor determined by 1984Ha29.
3730	3-	Γ_0=5.4×10^{-6} eV (1963Bl04), 15×10^{-6} eV *3* (1970St10). β_3=0.066 *7*, B(E3)=0.010, G=7.4 (1963Bl04). Others: B(E3)=0.021 (1969Ei03), 0.0149 *7* (1973Ha13). B(E3)(W.u.)=31.7 (1969Ei03), 27.3 *10* (1970It01), 24.9 *10* (1971He08), 22 *2* (1973Ha13).
3900	2+	Γ_0=0.021 eV (1963Bl04), 0.016 eV *3* (1970St10). β_2=0.016 *5*, B(E2)=0.0144, G=2.4 (1963Bl04). Others: B(E2)=0.84 (1969Ei03), 0.90 *10* (1973Ha13). B(E2)(W.u.)=2.0 (1969Ei03), 3.0 (1970It01), 2.00 *20* (1973Ha13).
4490	5-	B(E5)(W.u.)=9.7 *6*, 17.7 *15* (depending on shape factor) (1971He08); 18 *4* (1970It01). β_5=0.048 *5*, B(E5)=20.6×10^{-5}, G=2.0, Γ_0=0.63×10^{-6} eV (1963Bl04).
5250	2+	B(E2)(W.u.)=0.4 (1970It01).
5610	2+	B(E2)(W.u.)=0.4 (1970It01).
5920 *50*		E(level): from 1970It01 and 1971Fa15.
6160	(3-)	β_3=0.0048 *12*, B(E3)=0.73×10^{-3}, G=0.53 *13*, Γ_0=13.3×10^{-6} eV (1963Bl04).
6290	3-	B(E3)(W.u.)=4.6 *4* (1970It01).
6590	3-	B(E3)(W.u.)=2.5 *2* (1970It01).
6910	2+	E(level): from 1978Gr03. Other: 3- (1963Bl04). Γ_0=0.190 eV *6* (1978Gr03)
6951	1-	E(level): from 1978Gr03. Γ_0=0.51 eV *5* (1978Gr03).

Continued on next page (footnotes at end of table)

^{40}Ca Levels (continued)

E(level)	Jπ†	Comments
7100	(2+)	Jπ: from 1963Bl04. β_2=0.018 *2*, B(E2)=0.0162, G=2.7 *3*, Γ_0=0.47 eV (1963Bl04).
7870	(2+,4+)	Jπ: from 1970It01; 4+ from 1963Bl04; 2+ in Adopted Levels. β_4=0.011 *2* (1963Bl04). Other: B(E2)(W.u.)=1.3 or B(E4)(W.u.)=5 (1970It01).
8428 *5*	2-	E(level): from 1980St17. Γ_0=0.026 eV +*10*-*8* (1971Fa15).
8500	5-	Jπ: from 1963Bl04. Other: 2+,5- (1970It01). (1963Bl04). β_5=0.027 *3*, B(E5)=1.16×10^{-4}, G=1.1, Γ_0=406×10^{-13} eV (1963Bl04). Other: B(E2)(W.u.)=0.4 or B(E5)(W.u.)=7.0 (1970It01).
9868 *5*	1+	B(M1)=0.32 *9* (1995Pe01), 0.43 *4* (quoted by 1995Pe01 from Darmstadt group).
10319 *5*	1+	E(level): from 1979Gr09. B(M1)=1.06 *8* (1995Pe01), 1.110 *5* (quoted by 1995Pe01 from Darmstadt group).
10676	(2-)	B(M2)=0.16 *5* (1995Pe01), 0.15 *3* (quoted by 1995Pe01 from Darmstadt group).
10776 *6*	(1-)	E(level): from 1979Gr09; 3- in Adopted Levels.
11000	(3,4)	Jπ: from 1964Ho06.
11775	(1+)	B(M1)=0.35 *3* (1995Pe01).
12044	(1+)	B(M1)=0.09 *4* (1995Pe01). Jπ: 2- quoted by 1995Pe01 from Darmstadt group; 2+ in Adopted Levels
12200	3-	B(E3)(W.u.)=0.44 *3* (1964Ho06).
12332	(2-)	B(M2)=0.41 *21* (1995Pe01). Jπ: (1-,2+) quoted by 1995Pe01 from Darmstadt group.
12488	(1+)	B(M1)=0.10 *2* (1995Pe01). Jπ: 2- quoted by 1995Pe01 from Darmstadt group.
12503	(2-)	B(M2)=0.17 *5* (quoted by 1995Pe01 from Darmstadt group).
12622	(2)	B(M2)=0.19 *7* (quoted by 1995Pe01 from Darmstadt group).
12749	(2-)	B(M2)=0.13 *6* (1995Pe01), 0.06 *6* (quoted by 1995Pe01 from Darmstadt group).
12830	(1+,2-)	B(M1)=0.14 *3* (1995Pe01), 0.06 *4* (quoted by 1995Pe01 from Darmstadt group). Jπ: 2- is less probable.
13049	(1+)	B(M1)=0.26 *4* (1995Pe01), 0.25 *2* (quoted by 1995Pe01 from Darmstadt group).
13147	(2-)	B(M2)=0.48 *6* (1995Pe01), 0.34 *9* (quoted by 1995Pe01 from Darmstadt group).
13445	(2-)	B(M2)=0.55 *7* (quoted by 1995Pe01 from Darmstadt group).
13480	(1+)	B(M1)=0.26 *10* (1995Pe01). Jπ: 2-,(1+) quoted by 1995Pe01 from Darmstadt group.
13666	(2-)	B(M2)=0.66 *16* (1995Pe01), 0.27 *6* (quoted by 1995Pe01 from Darmstadt group).
13900	(2+)	B(E2)(W.u.)=0.18 *2* (1964Ho06).
14600	(1,2+,3-,4+)	
18.4×10^3 *16*		Γ=9.9 MeV *14* (1974Na15).
35.3×10^3 *5*		Γ=23.5 MeV *23* (1974Na15).
42.0×10^3		
58.4×10^3 *11*		Γ=31.9 MeV *11* (1974Na15).

† From Adopted Levels unless otherwise stated.

^{40}Ca(π^+,$\pi^{+\prime}$),(π^-,$\pi^{-\prime}$) 1981Mo17,1984Bo02,1982Bl09

Includes (π^+,π^+) and (π^-,π^-).
1981Mo17: E(π+), E(π^-)=180 MeV. Measured $\sigma(\theta)$, DWIA analysis.
1982Bl09: E(π+), E(π^-)=80 MeV. Measured $\sigma(\theta)$, θ=50° - 120°. Deduced GQR, DWBA analysis.
1984Bo02, 1981Bo26: E(π+), E(π^-)=116, 180, 292.5 MeV. Measured $\sigma(\theta)$, θ=20° - 70°.
1977Mi19 (also 1978Mi05): E(π+)=50 MeV. Measured $\sigma(\theta)$, θ=40°, 80°.
1978Eg03: E(π+)=130 MeV. Measured $\sigma(\theta)$.
1979Ar01: E(π+)=163, 261 MeV. Deduced GQR.
1984Ma42: E(π+), E(π^-)=675.7 MeV. Measured $\sigma(\theta)$, DWBA analyses, deduced optical-model parameters.
1985Ul01: E(π+), E(π^-)=135 MeV. Measured $\sigma(\theta)$, deduced GQR, giant monopole and low-energy giant octupole resonances.
(π^+,π^+), (π^-,π^-): $\sigma(\theta)$ and optical model parameters:.
1997Ka22 (672.5 MeV), 1988Wr01 (19.5,30 MeV), 1984Le01 (80 MeV), 1983Je01 (114-215 MeV), 1982Da13 and 1980DaZR (64.8 MeV), 1981Gr09 (130,180,230 MeV), 1978In04 (115 MeV), 1978DrZS (isobar resonance energy), 1977Eg02 (130 MeV).
(π^+,π^+): $\sigma(\theta)$ and optical model parameters:.
1983Ob02 (20 MeV), 1981Pr03 (30,50 MeV), 1979Bl07 (40 MeV), 1976WaZB (145,174,204 MeV).
(π^-,π^-): $\sigma(\theta)$ and optical model parameters:.
1997Ka22 (400 MeV), 1994Bu09 (40 MeV), 1990Se04 (30,50 MeV).

^{40}Ca Levels

E(level)	J$^\pi$	L†	$\beta_L(\pi$-),$\beta_L(\pi$+)	Comments
0	0+	0		
3350				
3740		3	0.56,0.5	S: from 1982Bl09.
3910		2		
4490		5	0.095,.081	
6275		3	0.085,.074	
6580		3	0.102,.122	
6700‡				
11700‡				
13400#		2#	0.11 *2*#	L=0 with β_0=0.13 *2* is not excluded (1982Bl09).
17500#		2#	0.26#	

† From 1984Bo02, 1982Bl09 and 1981Mo17.
‡ From 1977Mi19.
# From 1982Bl09; from (π^+,$\pi^{+\prime}$).

^{40}Ca(n,n′γ) 1972Di10,1972Ni05,1984El12

1972Ni05: (n,n′γ) E=fission spectrum. Measured Eγ, branching.
1972Di10: (n,n′γ) E=4.85-8.05 MeV. Measured Eγ, σ at 6 different energies.
1984El12 (also 1989Ge09): (n,n′γ) E=fast. Measured γ, lifetime by DSA.
Others:.
1963Ho08: (n,n′γ) E=14 MeV. Measured Eγ.

^{40}Ca Levels

Differential cross sections (in mb/sr) at different energies (125°)

Eγ	4.85 MeV	5.40 MeV	5.90 MeV	6.45 MeV	7.00 MeV	8.05
755	0.55 *10*	1.20 *15*	1.3 *2*	2.6 *3*	3.2 *3*	4.1 *4*
780					0.18 *9*	0.23 *7*
1122			0.32 *6*	0.91 *14*	1.14 *18*	1.45 *22*
1303		0.70 *11*	0.95 *14*	1.51 *20*	1.31 *19*	1.04 *15*
1345			0.41 *8*	0.33 *5*	0.28 *4*	0.39 *11*
1374			1.3 *2*	2.33 *25*	2.9 *3*	2.7 *3*
1651						0.66 *11*
1793					0.91 *22*	1.09 *13*
1877			0.42 *8*	0.81 *9*	0.69 *13*	0.75 *19*
2124				0.70 *15*	1.15 *15*	1.10 *15*
2288				1.70 *20*	2.7 *4*	2.6 *4*
2380					0.22 *11*	0.70 *15*
2605					0.64 *22*	
2854						
3013						0.45 *11*
3193						
3737	9.8 *10*	9.8 *10*	8.0 *12*	10.1 *10*	12.6 *13*	14.4 *15*
3905	12.6 *13*	9.6 *10*	8.6 *13*	9.7 *10*	10.5 *11*	8.7 *9*
5249		0.26 *7*	1.5 *2*	2.20 *22*	2.35 *24*	1.71 *18*
5629			0.3 *1*	1.7 *3*	1.3 *3*	1.7 *3*
5903				0.66 *8*	1.17 *17*	0.97 *13*
6909						1.40 *20*
6949						0.79 *12*

E(level)	$J^{\pi\#}$	$T_{1/2}$	Comments
0	0+		
3353	0+		Decays by pair production and consequently by annihilation radiation.
3737	3-		

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^{40}Ca Levels (continued)

E(level)	Jπ#	$T_{1/2}$	Comments
3905	2+	36 fs *14*	$T_{1/2}$: from DSAM (1984El12,1989Ge09).
4492	5-		
5212	0+		E(level): from 1972Ni05. Other: 5208 (1972Di10).
5249	2+		
5279	4+		
5614	4-		
5629	2+		
5903	1-		
6025	2-		
6029	3+		
6284	3-		
6510†	4+		
6542†	4+		
6582†	3-		
6750†	2-		
6909†	2+		
6930†‡	6+		
6931†‡	3-		
6949†	1-		

† From 1972Di10 only.
‡ According to Adopted Levels and gammas, 1651γ and 3193γ are from two separate levels near 6930, although 1972Di10 seem to show only one level.
# From Adopted Levels.

γ(^{40}Ca)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	Eγ†	dσ/dΩ (mb/sr) at 125°.§	Comments
Unplaced				2275[d]	0.50 *13*	
				2748[d]	0.72 *16*	
				3503[d]	0.23 *10*	
3737	3-	0	0+	3737 *2*	12.5 *13*	
3905	2+	0	0+	3905 *2*	10.0 *11*	
4492	5-	3737	3-	755 *2*	3.1 *3*	
5212	0+	3905	2+	1307[c]	1.20 *20*	1303 in 1972Di10 includes a line from ^{40}K.
5249	2+	3905	2+	1345 *2*	0.61 *15*	Iγ(1344)/Iγ(5249)=0.25 (1972Ni05).
		3353	0+	1897 *2*[a]	0.16 *8*	
		0	0+	5249 *2*	2.23 *25*	
5279	4+	3905	2+	1374 *2*	2.6 *3*	May include contribution from ^{40}K line.
5614	4-	4492	5-	1122 *2*	1.10 *24*	Iγ(1124)/Iγ(1880)=0.43 (1972Ni05).
		3737	3-	1877 *2*	0.63 *10*	
5629	2+	3353	0+	2275 *2*	0.50 *13*	Iγ(2277)/Iγ(5627)=0.10 (1972Ni05).
		0	0+	5629 *2*	1.05 *15*	Includes contribution from ^{16}O.
5903	1-	0	0+	5903 *2*	0.95 *11*	
6025	2-	3905	2+	2120[cb]		Eγ: 2124 in 1972Di10 is probably a doublet 2120+2124. Iγ(2120)/Iγ(2290)=0.25 (1972Ni05).
		3737	3-	2288 *2*	2.7 *5*	Doublet 2288+2294.
6029	3+	5249	2+	780 *2*	0.20 *6*	Iγ(780)/Iγ(2124)=0.13 (1972Ni05).
		3905	2+	2124 *2*	1.09 *15*	
		3737	3-	2294[c]		Iγ(2294)/Iγ(2124)=0.10 (1972Ni05). 2288γ in 1972Di10 is a doublet 2288+2294.
6284	3-	4492	5-	1793 *2*	0.75 *10*	May include contribution from ^{40}K line.
		3905	2+	2380 *2*	0.60 *25*	Iγ(2379)/Iγ(1793)=0.33 (1972Ni05).
6510	4+	3905	2+	2605 *2*[a]	0.45 *22*	
6542	4+	5279	4+	1262 *2*[a]	0.37 *12*	

Continued on next page (footnotes at end of table)

γ(^{40}Ca) (continued)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	$E\gamma$[†]	dσ/dΩ (mb/sr) at 125°.[§]	Comments
6582	3-	3905	2+	2679 *2*[a]	0.22 *9*	
6750	2-	3905	2+	2854 *2*[a]	0.16 *7*	
		3737	3-	3013 *2*[a]	0.74 *14*	
6909	2+	0	0+	6909 *2*[a]	1.02 *17*	
6930	6+	5279	4+	1651 *2*[a]	0.50 *10*	
6931	3-	3737	3-	3193 *2*[a]	0.55 *10*	
6949	1-	0	0+	6949 *2*[a]	0.51 *8*	

[†] From 1972Di10, unless otherwise stated.
[§] From 1972Di10. Values for other neutron energies are listed in the table below.
[a] γ from 1972Di10 only.
[b] Transition from 1972Ni05 only.
[c] From level-energy difference.
[d] Tentative γ from 1972Di10 only.

^{40}Ca(n,n′),(pol n,n′) 1990Ba49,1977Ba49,1986Ho05

(n,n′) and (pol n,n′) include (n,n) and (pol n,n).
1990Ol02: (n,n′) E=21.6 MeV. Measured $\sigma(\theta)$ for g.s., 3737 and 4491 levels, deduced deformation parameters.
1977Ba49: (n,n′) E=11, 20 MeV. Measured $\sigma(\theta)$; DWBA analysis.
1986Ho05, 1986De17 (also 1987HoZU): (n,n′), (pol n,n′) E=11-17 MeV. Measured $\sigma(\theta)$, Ay(θ) for unresolved 3737+3904 levels.
Others:.
1989Ra06: (n,n) E=thermal. Measured bragg diffraction pattern, scattering lengths.
1988Is03: (n,n′) E=18-60 MeV. Measured $\sigma(\theta)$.
1987Al03, 1987Al02 (also 1986AlZS): (n,n′) E=21.7, 25.5 MeV; measured $\sigma(\theta)$.
1986Wi01: (n,n). Analyzed $\sigma(\theta)$.
1982To11: (pol n,n) E=9.9, 11.9, 13.9 MeV. Measured $\sigma(\theta)$, Ay(θ). Deduced optical-model parameters.
1981De21 (also 1980DeZO): (n,n) E=30.3, 40 MeV. Measured $\sigma(\theta)$.
1979Ja26: (n,n) E=2-3 MeV. Measured $\sigma(\theta)$.
1977Ra16, 1977Ra12: (n,n) E=11, 20, 26 MeV. Measured $\sigma(\theta)$.
1977Fe01: (n,n) E=11 MeV. Measured $\sigma(\theta)$.
1973Ba69: (n,n′) E=3.52 MeV. Measured lifetime of 3353 level.
1973Wy03: (n,n′). Measured σ, deduced resonances.
1964Mc20: (n,n′) E=14.1 MeV. Measured $\sigma(\theta)$.
1959Kl46: (n,n′), pulsed neutrons from ^{3}H(p,n) reaction. Measured lifetime for 3353 level by detecting time decay of $\gamma^{\pm}$ radiation.

^{40}Ca Levels

E(level)†	J^{π}‡	$T_{1/2}$	L	β_L	Comments
0	0+				
3353	0+	2.21 ns *10*			$T_{1/2}$: weighted average of 2.35 ns *14* (1959Kl46) and 2.14 ns *10* (1973Ba69).
3737	3-		3	0.314 *16*	S: from 1990Ol02. Others: 0.359 *21* (1977Ba49), 0.33 (1987Al03).
3904	2+		2	0.096 *10*	S: from 1977Ba49. Other: 0.10 (1987Al03).
4491	5-		5	0.229 *12*	S: from 1990Ol02. Others: 0.26 *4* (1977Ba49), 0.23 (1987Al03).

† Rounded-off energy from Adopted Levels.
‡ From Adopted Levels.

^{40}Ca(p,p′),(pol p,p′) 1975No04,1981Ej02,1987Ya11

1975No04: E=35.2 MeV. Measured σ, levels.
1981Ej02: E=65 MeV. Measured $\sigma(\theta)$, FWHM=11 keV, DWBA analysis.
1987Ya11: E=65.1 MeV. Measured $\sigma(\theta)$, DWBA analysis.
Other references from which results are used in this dataset:.
1956Br98: E=7.17-8.00 MeV.
1964Ya02: E=55 MeV.
1965Gr11: E=14.6, 17.3 MeV. Measured $\sigma(\theta)$, deduced deformation parameters.
1968Wi05: E=155 MeV. Measured $\sigma(\theta)$, pol(θ), DWBA.
1970Bl03: E=20.3 MeV, pol p. Measured $\sigma(\theta)$, deduced deformation parameters.
1972Gr26: E=25, 30, 35, 40 MeV. Measured $\sigma(\theta)$.
1976Ka29: E=185 MeV. Measured $\sigma(\theta)$.
1976Al19: E=1.044 GeV. Measured $\sigma(\theta)$.
1982Bl10: E=800 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ). Deduced deformation parameters.
1982Ho13 (also 1982Ho15): E=65 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ), DWBA analysis.
1980Ad03: E=800 MeV, pol p. Measured $\sigma(\theta)$, Ay(θ). Deduced deformation parameters. DWBA analysis of known Jπ states.
1980Ca14: E=800 MeV. Measured $\sigma(\theta)$, deduced octupole giant resonance, DWBA analysis.
1981An08: E=201 MeV. Measured $\sigma(\theta)$, deduced M1 strength.
1985Ho14, 1984Ho16: E=334 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ), DWIA analysis.
1985Se14: E=500 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ).
1987Fr05: E=362 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ).
1989Le04: E=362 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ).
1993Se02: E=200 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ).
Others (p,p′):.
2000Ba18: E=319 MeV; pol p. Measured $\sigma(\theta)$, spin-flip probabilities.
1993Gr02: E=497, 581 MeV; pol p. Measured spin-flip observables.
1991Ke13: E=318 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ).
1990Ba14: E=300, 800 MeV; pol p. Measured spin-flip probability.
1989Sa23: E=65 MeV. Measured $\sigma(\theta)$, FWHM=20-25 keV.
1989Ba55: E=319 MeV; pol p. Measured absolute $\sigma(\theta)$.
1989Ho11: E=500 MeV. Measured $\sigma(\theta)$.
1989Li15: E=500 MeV; pol p. Measured $\sigma(\theta)$, FWHM=70 keV. Deduced giant resonance (L=2,4) strengths.
1988Ba06: E=318 MeV; pol p. Measured $\sigma(\theta)$.
1987Gl02: E=319 MeV; pol p. Measured $\sigma(\theta)$, spin-flip probability.
1987Ba22: E=500 MeV; pol p. Measured $\sigma(\theta)$, Ay(θ), DWBA.
1986Aa01: E=500 MeV; pol p. Measured spin-rotation parameters.
1983Mi25: E=650 MeV; pol p. Measured $\sigma(\theta)$, DWIA analysis.
1982Ga02: E=800 MeV. Deduced deformation lengths.
1982Aa04: E=497 MeV; pol p. Measured proton depolarization tensor parameters.
1981Co08: E=31,32,35.5,40,42 MeV, pol p. Measured spin-flip probability.
1980Va10: E=60.3 MeV. Measured $\sigma(\theta)$, DWBA analysis.
1977Vo09: E=19 MeV. Measured $\sigma(\theta)$.
1977Ul01: E=7-10 MeV. Measured proton-pair coin.
1975Ma07: E=155 MeV. Measured $\sigma(\theta)$.
1974Pl02: E=20 MeV, pol p. Measured $\sigma(\theta)$, pol(θ).
1973Go42: E=20-25 MeV, pol p. Measured $\sigma(\theta)$, Ay(θ).
1972Co11: E=1 GeV. Measured $\sigma(\theta)$.
1970Wh06: E=5.8-6.6 MeV. Measured $\sigma(\theta)$.
1970Ka44: E=185 MeV. Measured $\sigma(\theta)$, deduced B(EL).
1970In03: E=185 MeV. Measured $\sigma(\theta)$, pol(θ) for first 3-.
1968Va27: E=6.28-6.73 MeV. Deduced IAR.
1968Ba64: E=13 MeV. FWHM=50 keV. About 25 groups reported.
1966Wa12: E=160 MeV.
1966Ma13: E=11.5 MeV.
1966Li02: E=155 MeV. Measured $\sigma(\theta)$.
1965Ru01: E=4.26 MeV.
1965Ha28: E=156 MeV.
1964St15: E=40 MeV.
1964Bo27: pol p.
1964Ti02:.
1963Ro30: E=150 MeV.
1963Ho26: E=155 MeV.
1962Va14: E=6.6 MeV.

Others: 1964Ti02, 1958Go90, 1955Be73.
(p,p), (pol p,p): deduced optical-model parameters from $\sigma(\theta)$:.
1989Gr12: E=200 MeV; pol p.
1988Hu10: E=200, 300, 400, 500 MeV; pol p.
1988Ho05: E=497.5 MeV; pol p.
1988Le10: E=200, 362, 400 MeV; pol p.
1988Ot04: E=200, 500, 800 MeV; pol p.
1988Bl07: E=320, 400, 650 MeV; pol p.
1986Mc05: E=21-48.4 MeV. Measured $\sigma(\theta)$.
1986Fe01: E=800 MeV; pol p.
1983Ba05: E=800 MeV; pol p.
1982Sc17: E=80.2, 181.5 MeV; pol p.
1982Sa19 (also 1982Sa37): E=65 MeV; pol p.
1982Al18: E=1 GeV.
1981Ra21: E=497 MeV, pol p.
1981Ra02: E=800 MeV.
1981No07: E=65 MeV, pol p.
1981Na02: E=80.2, 135.1, 160 MeV.
1981Ho26: E=500 MeV, pol p.
1980Fa07: E=35.2 MeV.
1979Sa38: E=65 MeV, pol p.
1979Ig01: E=800 MeV, pol p.
1977Ch29: E=1 GeV.
1975Al08: E=1 GeV.
1974Pl05: E=20, 24.5 MeV, pol p.
1974Gu14: E=5-6 MeV.
1974Co09: E=156 MeV.
1973Be41: E=40 MeV, pol p.
1973Ba79: E=1 GeV.
1972Lo10: E=10.8-16.3 MeV.
1972Kl03: E=2.3-2.8 MeV, pol p.
1971Va09: E=10-180 MeV.
1971Hn02: E=30.3 MeV, pol p.
1971Di17: E=10-22 MeV.
1971Br22: E=21.0, 23.5, 26.3, 48.0 MeV.
1970Ma54: E=25, 30, 35, 40 MeV.
1969Fu07: E=61.4 MeV.
1968Pr16: E=6.3-6.9 MeV.
1967Gr19: E=35.8, 45.5 MeV.
Level energy data: 1987Ya11, 1981Ej02, 1975No04, 1981An08, 1972Gr26, 1965Gr11.
L-transfers: 1972Gr26, 1993Se02, 1984Ho16, 1976Al19, 1976Ka29, 1970Bl03, 1965Gr11, 1964Ya02.
Jπ from (pol p,p′): 1993Se02, 1989Le04, 1987Fr05, 1985Ho14, 1982Bl10, 1982Ho13, 1968Wi05.
Differential cross sections at 15.4° in μb/sr (from 1975No04) are listed under comments. 1975No04 give cross sections at 30.7° also. Both sets of data were normalized to cross section for 4492, 5- level as determined by 1972Gr26. The uncertainties are 10%, unless otherwise stated.
B(EL)(W.u.) values given under comments are from 1972Gr26.
Differential cross sections listed under comments are in μb/sr, and taken from 1975No04.

^{40}Ca Levels

E(level)[†]	Jπ	L	β_LR[‡]	Comments
0	0+	0		
3352.1 *3*	0+[c]	0		L: from 1993Se02. dσ/dΩ=126 μb/sr.
3736.4	3-	3	1.39[e]	β_3=0.41 (1985Se14). Jπ: from (pol p,p′) (1968Wi05,1982Ho13,1982Bl10,1987Fr05,1989Le04). S: 1.35 (1972Gr26). B(E3)(W.u.)=28.7 *20*. Other β_3=0.340 (1982Bl10). dσ/dΩ=11300 μb/sr (1972Gr26).
3904.1	2+	2	0.52[e]	β_2=0.14 (1985Se14). Jπ: from (pol p,p′) (1987Fr05,1984Ho16).

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^{40}Ca Levels (continued)

E(level)[†]	Jπ	L	β_LR[‡]	Comments
				S: 0.42 (1972Gr26), 0.43 (1984Ho16). Other β_2=0.133 (1982Bl10). dσ/dΩ=2240 (1972Gr26). B(E2)(W.u.)=2.05 *20*.
4491.5	5-	5	0.76[e]	Jπ: from (pol p,p′) (1987Fr05,1982Bl10). S: 0.83 (1972Gr26). Other β_5=0.215 (1982Bl10). dσ/dΩ=1560 (1972Gr26). B(E5)(W.u.)=20.6 *21*.
5213.8 *5*				dσ/dΩ=13 *4*.
5249.5	2+[b]	2	0.12	S: 0.11 (1984Ho16). dσ/dΩ=575.
5279.3 *3*		4	0.14	dσ/dΩ=122.
5614.3		5	0.33	dσ/dΩ=194.
5630.1 *3*	2+[b]	2	0.15[e]	L: from 1984Ho16. S: 0.13 (1984Ho16). dσ/dΩ=248. B(E2)(W.u.)=0.13 *5*.
5903.3 *3*				dσ/dΩ=503.
6026.2 *3*	2-	3	0.18	Jπ: from (pol p,p′) (1982Ho13). dσ/dΩ=268.
6285.8	3-[c]	3	0.38[e]	S: 0.41 (1972Gr26). dσ/dΩ=1471. B(E3)(W.u.)=3.1 *3*.
6422	2+	2	<0.04	E(level): from 1984Ho16 only.
6508.4 *3*		4	0.18	dσ/dΩ=114.
6543.6 *4*				dσ/dΩ=32.
6583.3 *3*	3-[c]	3	0.34[e]	S: 0.33 (1972Gr26). dσ/dΩ=975. B(E3)(W.u.)=2.53 *3*.
6750.9 *3*	2-	3	0.22	Jπ: from (pol p,p′) (1982Ho13). dσ/dΩ=410.
6909.1 *3*	2+[b]	2	0.49[e]	S: 0.42 (1972Gr26,1984Ho16). dσ/dΩ=2316. B(E2)(W.u.)=2.25 *23*.
6931.8 *3*				dσ/dΩ=190.
6950.9 *4*				dσ/dΩ=2457.
7113.9 *4*		5	0.29	L: other: 3 (1965Gr11). dσ/dΩ=164.
7240 *10*[&]				dσ/dΩ<10.
7278.0 *4*				dσ/dΩ=76.
7300.7 *5*		2	0.09	dσ/dΩ=25 *4*.
7399 *10*[&]				dσ/dΩ<10.
7425 *1*				dσ/dΩ<10.
7447.1 *6*		4	0.16	dσ/dΩ=33 *5*.
7466.2 *6*	2+[b]	2	<0.07	L: from 1984Ho16. dσ/dΩ=46.
7532.5 *5*		(3)	0.17	E(level): 1972Gr26 did not resolve this level from 7561 but assigned L=(3) and (4), respectively. dσ/dΩ=221.
7561.6 *5*			0.20	dσ/dΩ=146.
7623.5 *5*				dσ/dΩ=49.
7658.5				dσ/dΩ=59.
7676.4 *6*				dσ/dΩ=34 (30.7°).
7694.4 *6*				dσ/dΩ=44 (30.7°).
7701.2 *6*				dσ/dΩ=42 (30.7°).
7769.4 *10*				dσ/dΩ=8 *2*.
7814.7 *6*				dσ/dΩ=15 *3* (30.7°).

Continued on next page (footnotes at end of table)

^{40}Ca Levels (continued)

E(level)[†]	Jπ	L	β_LR[‡]	Comments
7871.7 *5*	2+[b]	2	0.23	dσ/dΩ=696. S: 0.28 (1984Ho16). B(E2)(W.u.)=0.92 *15*.
7927.9 *5*		4	0.29	dσ/dΩ=333. B(E4)(W.u.)=2.2 *2*.
7976.3 *6*[@]				dσ/dΩ=92.
8018.8 *10*				dσ/dΩ=15 *3*.
8051.8 *6*				dσ/dΩ=52.
8091.2 *6*	2+[b]	2	0.17	dσ/dΩ=269. S: 0.21 (1984Ho16). B(E2)(W.u.)=0.38 *6*.
8113.1 *6*		3	0.16	dσ/dΩ=115.
8138.1 *10*				dσ/dΩ<20.
8186.8 *10*		(6)	0.15	E(level): unresolved from 8196 in 1972Gr26. dσ/dΩ=15 *4*.
8195.9 *6*				dσ/dΩ=33 *5*.
8271 *1*[@]				dσ/dΩ=170 *34*.
8276 *1*[@]				dσ/dΩ=250 *50*.
8323.1 *6*				dσ/dΩ=23 *5*.
8339.1 *6*				dσ/dΩ=36.
8358.9 *6*				dσ/dΩ=121.
8373.3 *6*		(4)	0.35[e]	E(level): unresolved from 8359 in 1972Gr26. S: 0.31 (1972Gr26). dσ/dΩ=348. B(E4)(W.u.)=2.0 *2*.
8424.2 *7*	2-	3	0.25	Jπ: from (pol p,p′) (1985Ho14,1982Ho13). dσ/dΩ=279.
8439.0 *7*				dσ/dΩ=100.
8484.3 *7*				dσ/dΩ=50.
8551.1 *7*		5	0.19	dσ/dΩ=169.
8578.2 *7*	2+	2	0.17	Jπ: from 1982Ho13 and 1984Ho16. S: 0.16 (1984Ho16). dσ/dΩ=439.
8626 *10*[&]				dσ/dΩ<8.
8665.3 *8*				dσ/dΩ=112.
8747.7 *8*	2+[b]	2	0.15	S: 0.12 (1984Ho16). dσ/dΩ=392.
8805 *10*[&]				dσ/dΩ<8.
8850.6 *9*		7	0.09	S: 0.28 for L=6. dσ/dΩ=42.
8909.0 *9*[&]				dσ/dΩ=24.
8938.4 *9*				dσ/dΩ=66.
8978 *6*		6	0.17	E(level): from 1981An08 and 1987Ya11.
8995.0 *10*				dσ/dΩ=50.
9032.7 *10*		5	0.16	dσ/dΩ=177.
9050.1 *10*				dσ/dΩ=47.
9080.3 *11*				dσ/dΩ=20 *5*.
9093.0 *11*				dσ/dΩ=32 *6*.
9136.1		3	0.23	dσ/dΩ=177.
9162.1 *11*				dσ/dΩ=131.
9185.3 *12*				dσ/dΩ=30 *5*.
9209.0 *12*				dσ/dΩ=317.
9227.5 *12*				dσ/dΩ=75.
9246.0 *12*		7	0.06	S: 0.23 for L=5. dσ/dΩ=40 *12*.
9274.5 *12*				dσ/dΩ=38.
9372 *5*		3	0.16	
9418 *5*		3	0.26	

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^{40}Ca Levels (continued)

E(level)[†]	Jπ	L	$\beta_L R$[‡]	Comments
9465 *5*				
9547 *5*		4	0.15	
9591 *4*		3	0.12	E(level): from 1972Gr26.
9657 *5*				
9859 *4*		5	0.19	
9877 *5*[@]	(2+)	2	0.14	L: 0,1 (1984Ho16) for second component. S: from 1984Ho16 for a doublet at 9868. Jπ: 1+ in Adopted Levels.
10058 *5*		5	0.19	
10287 *5*		4	0.18	
10290 *5*				
10328 *5*	1+			Jπ: from (pol p,p′) (1985Ho14).
10344 *5*				
12030[&]		1		L: from 1981An08.
13420		(2)[d]		
13450[#]				
13510[#]				
13610		2[d]		
13700		2[d]		
13830		(2)[d]		
13890		(0)[d]		
13921 *15*[a]	(4-)			T=0 (1989Sa23). Jπ: from $\sigma(\theta)$ (1989Sa23); but L=(4) in 1987Ya11.
14020		(3)[d]		
14100		2[d]		
14210		(3)[d]		
14283 *15*[a]	(6-)			T=1 (1989Sa23). Jπ: from $\sigma(\theta)$ (1989Sa23).
14320		(3)[d]		
14410		3[d]		
14500		2[d]		E(level): doublet: 14490+14530.
14660		2[d]		
14780		2[d]		
15080[#]				
31×10^3 *2*		3		E(level): from 1980Ca14. Γ=10 MeV *2* (1980Ca14).

[†] From 1975No04 for levels up to 9300 (level energies where no uncertainties are stated were used as calibrants); from 1981Ej02 for levels between 9370 and 10350; from 1987Ya11 for levels between 13500 and 15100; others as specified L; from 1972Gr26; others as noted.
[‡] From 1972Gr26, unless otherwise stated.
[#] Multiplet.
[@] Doublet.
[&] From 1981An08.
[a] From 1981Ej02.
[b] From 1984Ho16.
[c] From 1993Se02.
[d] From 1987Ya11.
[e] From 1980Ad03.

^{40}Ca(p,p′γ) 1973Te04,1969Po04,1969An09

Other main references: 1977Ul01, 1968Ma05, 1966Gr03.
1973Te04: E=12 MeV. Measured p-γ coin, deduced branching ratios and lifetimes.
1969Po04: E=8.5-9.0 MeV. Measured γ(θ), lifetimes by DSAM.
1969An09: E=8.5-10 MeV. Measured pγ(θ), γγ(θ), lifetimes by DSAM.
1968Ma05, 1969Ma19, 1971Ma03: E=8-10, 7.73, 7.32 MeV. Measured pγγ coin, pγ(θ), γγ(θ), lifetimes by DSAM.
1966Gr03: E=13.065 MeV. Measured pγ coin, pγ(θ).
Others:.
1988Ga22: E=10.2 MeV. Measured pair production spectra.
1984Sc37: E=5.08 MeV. Measured γγ(θ) for double γ decay from first excited 0+ state.
1980Al13: E=6.253 MeV. Measured pγ(θ), pγ(t).
1977Ul01: E=7-10 MeV. Measured proton-pair coin, deduced E0 branching from 0+ levels.
1974He13: E=7.68, 9.27 MeV. Measured γ(θ,H,t), hyperfine fields and magnetic moment.
1973Te04, 1971Te02, 1970Te01, 1969Te03: E=12 MeV. Measured pγ coin, lifetimes by DSAM.
1972Ta17: E=8.7 MeV. Measured pγ(t).
1972Si01: E=10.81 MeV. Measured pγγ coin, pγ(θ), lifetimes by DSAM.
1970Ha27: E≈5.08 MeV. Measured γγ coin.
1969Ca17: E=6.14 MeV. Measured γγγ coin.
1968Ba64: (p,p′γ) E=13 MeV. 16 levels reported.
1967Sc39: E=5.4 MeV. Measured pγ(t).
1965Ne04 (also 1963Ro30): E=150 MeV. Measured pγ coin, pγ(θ).
1963Su12: E=4.4, 5.08 MeV. Measured pγγ coin; deduced E0 branch.
Others: 1967Ba02, 1966Go23 (also 1963Go34,1961Go30,1960Go20,1958Go90), 1962Ne02, 1960Wa15, 1959Kl46, 1959Ch28, 1958Hi66, 1958Be15, 1957Ty36, 1955Be73.

^{40}Ca Levels

E(level)†	Jπ#	$T_{1/2}$‡	Comments
0	0+		
3353 *2*	0+	2.17 ns *8*	$T_{1/2}$: weighted average from 1967Sc39 and 1959Kl46.
3736.7 *3*	3-	40.9 ps *35*	$T_{1/2}$: from 1972Ta17.
3904.6 *4*	2+	34 fs *7*	
4491.6 *4*	5	>4.9 ps	g=+0.54 *10* (1974He13). $T_{1/2}$: from 1969Po04.
5212.4 *5*	(0+)	1.1 ps *3*	Jπ: 1 is not ruled out; adopted Jπ=0+.
5248.5 *5*	2+	94 fs *17*	
5277.8 *5*	4+	226 fs *27*	
5613.9 *4*	4-	0.69 ps *10*	Jπ: stretched dipole to J=3 and γ to J=5.
5628.6 *8*	2+	42 fs *15*	Jπ: assigned to this level which was not resolved from 5613 by 1966Gr03.
5903.1 *16*	1-	42 fs *14*	
6025.4 *4*	2,3	171 fs *21*	Jπ: 2- in Adopted Levels.
6029.3 *7*	2,3	0.42 ps *8*	Jπ: 3+ in Adopted Levels.
6285.1 *4*	3	0.35 ps *3*	
6508.2 *7*	4+	128 fs *21*	
6543.1 *7*	4+	121 fs *21*	
6582.1 *6*	2,3	173 fs *28*	Jπ: 3- in Adopted Levels.
6751.0 *8*	2-	96 fs *28*	E(level): weighted average 1973Te04 and 1972Si01. Jπ: from 1972Si01. $T_{1/2}$: from 1973Te04 and 1972Si01.
6910.8 *10*		<10 fs	
6928.3 *25*		104 fs *28*	
6938.0 *18*		0.42 ps *17*	
6952.8 *15*		<10 fs	
7113.1 *10*		55 fs *28*	
7115.2 *7*		35 fs *21*	
7238.6 *6*		97 fs *49*	
7278.1 *8*		49 fs *35*	
7298.6 *10*		118 fs *35*	
7397.2 *10*		0.47 ps *14*	
7421.9 *15*		0.20 ps *14*	
7446.1 *15*		140 fs *50*	

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^{40}Ca Levels (continued)

E(level)†	Jπ#	T1/2‡	Comments
7468.5 *6*		<10 fs	
7531.2 *17*		149 fs *35*	
7559.3 *10*		166 fs *42*	
7623.0 *15*		111 fs *28*	
7658.5 *17*		<10 fs	
7677.3 *10*		200 fs *50*	
7694.5 *8*		<10 fs	
7771.2 *20*		166 fs *35*	
7813.5 *30*			
7873.7 *10*		<14 fs	
7927.2 *20*		49 fs *35*	
7977.2 *10*		21 fs *21*	
8018 *3*			
8093.2 *20*		<28 fs	
8115.2 *20*		<14 fs	
8134.5 *15*		<28 fs	
8188.7 *15*		<17 fs	
8268 *4*			
8275 *4*			
8321.0 *20*		42 fs *21*	
8358.1 *20*		104 fs *21*	
8364 *5*			
8425.3 *20*		<17 fs	
8437 *4*			
8485.2 *30*		24 fs *14*	
8541		14 fs *14*	
8552.6 *20*		<17 fs	
8573 *4*		<21 fs	
8587 *6*			
8633 *6*@			
8671 *6*			
8676 *6*@			
8717 *8*@			
8756 *8*			
8769 *8*@			
8819 *10*@			
8860 *10*@			
8922 *10*@			
8949 *10*@			
9011 *10*			

† Weighted average from 1969Po04 and 1973Te04, unless noted otherwise. Above 6580, all levels are from 1973Te04.
‡ From DSAM; weighted average from 1973Te04, 1969Po04, 1969An09, 1968Ma05 and others as noted. Above 6580, all levels are from 1973Te04.
# From 1969An09 and 1966Gr03. Parities are from multipolarities suggested by RUL. Values from Adopted Levels are listed under comments in cases where these differ.
@ No γ's reported by 1973Te04.

γ(^{40}Ca)

A_2 and A_4 coefficients are from 1969An09 and/or 1966Gr03.

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
3353	0+	0	0+	3353		E0		Decays to g.s. by electron-positron internal pair formation. I(ce)/I(e+e- internal pair)=0.00694 *20* (1962Ne02); I(2-photon)/I(e+e- internal pair)=0.00036 *9* (weighted average from 1984Sc37 and 1973Be24). Earlier measurements: only upper limits deduced.
3736.7	3-	0	0+	3736.5 *3*	100	E3		A_2=+0.81 *3*, A_4=+0.17 *6*, A_6=+0.33 *8* (1966Gr03).
3904.6	2+	0	0+	3904.4 *4*	100	E2		A_2=+0.59 *3*, A_4=-1.20 *5* (1966Gr03).
4491.6	5	3736.7	3-	754.7 *2*	100	Q(+O)	+0.05 *5*	A_2=+0.33 *5*, A_4=-0.26 *8* (1966Gr03).
		0	0+	4491	<0.5			
5212.4	(0+)	3904.6	2+	1307.7 *3*	100			A_2=0.00 *1*, A_4=-0.01 *1* (1966Gr03).
		0	0+	5212				I_γ: I(e+e- internal pair)<0.0014 (1977Ul01).
5248.5	2+	3904.6	2+	1344.4 *3*	15 *4*	M1+E2	+13 *+6-3*	A_2=-0.02 *4*, A_4=-0.20 *6* (1969An09).
		3353	0+	1895	1.7 *10*	(E2)		I_γ: from B(E2)=0.035 *6* (1977Ul01).
		0	0+	5247.9 *6*	83 *4*	E2		A_2=+0.46 *3*, A_4=-0.63 *3* (1969An09).
5277.8	4+	3904.6	2+	1373.0 *3*	100	Q(+O)	+0.02 *4*	A_2=+0.46 *4*, A_4=-0.28 *5* (1966Gr03).
5613.9	4-	4491.6	5	1122.8 *2*	29 *3*			
		3736.7	3-	1876.9 *4*	71 *3*	D		Mult.: A_2=-0.75 *20* (1966Gr03).
5628.6	2+	3904.6	2+	1724	<3			
		3353	0+	2277.5 *10*	13 *3*			
		0	0+	5628.3 *5*	87 *3*	E2		A_2=+0.38 *5*, A_4=+0.53 *9* (1966Gr03).
5903.1	1-	3736.7	3-	2167	<5			
		3353	0+	2551	<6			
		0	0+	5902.6 *15*	100	E1		A_2=-0.51 *3* (1966Gr03).
6025.4	2,3	3904.6	2+	2121.0 *6*	20 *5*			A_2=+0.41 *15*, A_4=+0.07 *22* (1969An09). δ: δ(O/Q)=0.0 *1* for J=2; δ(Q/D)=+3.7 *+70-15* for J=3.
		3736.7	3-	2289.0 *3*	80 *5*	D+Q		A_2=+0.02 *5*, A_4=-0.22 *8* (1969An09). δ: -2.8 *5* for J=2; +3.7 *10* for J=3. Other: -4.7 *+20-10* (1966Gr03) for doublet.
		0	0+	6025	<3			
6029.3	2,3	5277.8	4+	751	3 *1*			
		5248.5	2+	781	13 *4*	Q(+D)	>2	A_2=+0.07 *15*, A_4=+0.53 *22* (1969An09).
		3904.6	2+	2124.4 *3*	87 *4*			A_2=+0.06 *7*, A_4=+0.23 *10* (1969An09).
		3736.7	3-	2292	<20			A_2=0.16 *7*, A_4=+0.03 *9* (1969An09).
		0	0+	6029	<6			
6285.1	3	4491.6	5	1793.3 *2*	73 *5*	Q(+O)	-0.03 *17*	A_2=+0.18 *4*, A_4=-0.05 *7* (1966Gr03).
		3904.6	2+	2380.0 *5*	24 *5*	D		A_2=-0.52 *12*, A_4=0.00 *17* (1966Gr03).

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
		0	0+	6284	3 *2*			
6508.2	4+	6029.3	2,3	479	<5			
		5628.6	2+	879	<5			
		5277.8	4+	1230	<3			
		5248.5	2+	1260	13 *3*			
		3904.6	2+	2603.2 *3*	84 *5*	E2(+M3)	-0.09 *9*	A_2=+0.38 *3*, A_4=-0.40 *4* (1969An09).
6543.1	4+	5628.6	2+	914	16 *4*	E2		A_2=+0.53 *12*, A_4=-0.28 *19* (1969An09).
		5277.8	4+	1265	6 *3*			
		5248.5	2+	1295	7 *3*			
		3904.6	2+	2638.1 *3*	71 *9*	E2(+M3)	-0.07 *7*	A_2=+0.41 *3*, A_4=-0.35 *4* (1969An09).
6582.1	2,3	5613.9	4-	969	5 *2*			
		4491.6	5	2090	5 *2*			
		3904.6	2+	2677	20 *5*			
		3736.7	3-	2845.1 *3*	70 *10*			A_2=+0.11 *15*, A_4=-0.39 *21* (1969An09).
		0	0+	6582	<6			
6751.0	2-	3904.6	2+	2846	15			
		3736.7	3-	3014	85	M1+E2	-0.84 *16*	Mult.: from p$\gamma(\theta)$ and p$\gamma\gamma(\theta)$ (1972Si01); parity from RUL.
6910.8		0	0+	6910	100			
6928.3		5277.8	4+	1652	50			
		3736.7	3-	3190	50			
6938.0		3736.7	3-	3201	>80			
6952.8		0	0+	6952	100			
7113.1		5628.6	2+	1485	3			
		5212.4	(0+)	1900	14			
		3904.6	2+	3207	18			
		0	0+	7113	65			
7115.2		4491.6	5	2623	20			
		3736.7	3-	3378	60			
7238.6		5613.9	4-	1624	20			
		4491.6	5	2746	40			
		3736.7	3-	3501	40			
7278.1		3736.7	3-	3541	>80			
7298.6		5628.6	2+	1670	<10			
		5248.5	2+	2050	>80			
7397.2		5277.8	4+	2119	>80			
7421.9		3736.7	3-	3685	>80			
7446.1		5613.9	4-	1831.5 *10*	40			
		5277.8	4+	2169	30			
		5248.5	2+	2198	30			
7468.5		0	0+	7468	100			
7531.2		5613.9	4-	1918	30			
		3736.7	3-	3794	70			
7559.3		5248.5	2+	2311	40			
		3736.7	3-	3822	60			
7623.0		5628.6	2+	1994	25			
		5613.9	4-	2009	25			
		3736.7	3-	3886	50			
7658.5		5613.9	4-	2045	50			
		4491.6	5	3167	27			
		3736.7	3-	3921	23			
7677.3		5277.8	4+	2399	>80			
7694.5		3736.7	3-	3957	>90			
7771.2		5613.9	4-	2158	30			

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	I_γ‡	Mult.§	δ§	Comments
		3736.7	3-	4034	70			
7813.5		5248.5	2+	2565	30			
		3904.6	2+	3908	70			
7873.7		0	0+	7873	100			
7927.2		5613.9	4-	2314	40			
		4491.6	5	3435	50			
		3736.7	3-	4190	10			
7977.2		5277.8	4+	2699	10			
		3904.6	2+	4072	50			
		3353	0+	4624	30			
		0	0+	7977	10			
8018		5248.5	2+	2770	>80			
8093.2		0	0+	8092	100			
8115.2		0	0+	8114	100			
8134.5		5628.6	2+	2506	20			
		4491.6	5	3643	40			
		3904.6	2+	4229	40			
8188.7		3736.7	3-	4452 *8*	>80			
8268		6952.8		1315	60			
		5903.1	1-	2364	40			
8275		5628.6	2+	2646	>60			
8321.0		6025.4	2,3	2296	15			
		3736.7	3-	4584 *15*	85			
8358.1		6952.8		1405	>90			
8364		4491.6	5	3872	>80			
8425.3		3736.7	3-	4688 *15*	>90			
8437		5628.6	2+	2808	>80			
8485.2		3736.7	3-	4748	>90			
8541		3353	0+	5188	40			
		0	0+	8540	60			
8552.6		4491.6	5	4061	100			
8573		0	0+	8572	100			
8587		6025.4	2,3	2562	15			
		5277.8	4+	3309	15			
		3904.6	2+	4682	10			
		3736.7	3-	4850	60			
8671		0	0+	8670	>80			
8756		0	0+	8755	100			
9011		0	0+	9009	100			

† Weighted average of 1973Te04, 1969Po04 and 1968Ma05. Above 6580 level, all levels and gammas are from 1973Te04.
‡ From 1969An09, 1969Po04 and 1966Gr03.
§ From $p\gamma\gamma(\theta)$ (1966Gr03); RUL used for parity assignment.

^{40}Ca(p,pα),(p,2p):resonances 2001Sc25

2001Sc25: E=100 MeV. Measured $\sigma(\theta)$, DWBA analysis.
1994Vo05: (p,p′a) E=99.1 MeV, deduced electric giant resonances.
1981Na03: (p,pα) E=101.3 MeV. Measured $\sigma(\theta)$.
1981Ca02: (p,pα) E=101.5 MeV. Measured $\sigma(\theta)$.
1976Ba38: (p,pα) E=157 MeV. Measured $\sigma(\theta)$.
1969Ja12: (p,2p) E=385 MeV.
1964Ru05: (p,2p) E=150 MeV.

^{40}Ca Levels

E(level)	J^{π}	Comments
11700		E(level): resonance in (p,p′p) to ^{39}K g.s.; FWHM=800.
12300		E(level): resonance in (p,p′a) to ^{36}Ar g.s.; FWHM=300.

^{40}Ca(d,d′),(pol d,d′) 1966Ni02,1968Ha31,1989Ec01

Includes (d,d) and (pol d,d).
1966Ni02: E=12.8 MeV. Measured $\sigma(\theta)$; DWBA analysis.
1968Ha31: E=7.5 MeV. Measured $\sigma(\theta)$, θ=22.5° - 157.5°.
1989Ec01: (pol d, d′) E=23.2 MeV. Measured Ay(θ), θ=15° - 110°.
1980Wi12: E=108 MeV. Measured $\sigma(\theta)$, θ=4° - 20°.
1989Sa23: E=56 MeV. Measured $\sigma(\theta)$ for 14-MeV level, FWHM=25 keV. Compared (d,d′) and (p,p′) results.
1992Mo17: (pol d,d′) E=400 MeV. Measured Ay(θ), deduced spin-transfer parameter (ΔS).
Other: 1974PeZW: (d,d′) and (pol d,d′) E=29 MeV.
(d,d): most references report $\sigma(\theta)$ and deduce optical-model parameters:.
1980Im01 (E=4.50-5.43 MeV), 1977An24 (E=1.8-3.0 MeV), 1970Ve02 (E=13.6 MeV), 1970Se01 (E=11.12 MeV), 1970Fi01 (E=11.8 MeV), 1970Bu08 (E=28 MeV), 1970Br27 (E=10 MeV), 1968Le05 (E=5-6.5 MeV), 1968Ga13 (E=28 MeV), 1968Be36 (E=7.0, 7.2 MeV).
(pol d,d): Ay(θ) and optical-model parameters:
1998Oh05 (E=270 MeV), 1994Mo21, 1994Ko47 (E=380 MeV), 1987Ta15 (E=22 MeV), 1987Er03 (E=52 MeV), 1986Ma32 (E=56 MeV), 1985Ng01 (E=700 MeV), 1984Fr14 (E=20 MeV), 1982Cl03 (E=20 MeV), 1982Cl01 (E=18-23 MeV), 1980Ha14 (E=56 MeV), 1977Pe07, 1974Ro09 and 1974PeZW (E=30 MeV), 1971Bo44 and 1971Bo39 (E=1.6-3.0 MeV), 1969Sc02 (E=5,7,9,11 MeV).

^{40}Ca Levels

E(level)†	J^{π}#	Γ@	L‡	β_L&	Comments
0	0+		0		
3352 *8*			0	0.07	
3735 *8*	3-		3	0.31	S: other: 0.21 *2* (1980Wi12). ΔS=0 (1992Mo17).
3903 *8*	2+		2		L: from 1989Ec01; very weakly populated level in 1966Ni02.
4480			5	0.15	E(level): from 1966Ni02.
7561					E(level): from 1989Sa23.
9000					E(level): from 1992Mo17; ΔS=0.
13921 *15*					E(level): from 1989Sa23 and 1992Mo17; T=0, ΔS=1.
14.5×10^3 *2*	0+&2+	1.5 MeV *2*	0+2		E(level): from 1980Wi12.
15.0×10^3	1+				E(level): from 1992Mo17, T=0. Jπ: 1992Mo17.
18.2×10^3 *5*	0+&2+	4.0 MeV *3*	0+2		E(level): from 1980Wi12. Jπ: from 1980Wi12.

† From 1968Ha31, unless otherwise stated.
‡ From 1966Ni02 and 1989Ec01, except when noted otherwise.
# From Ay(θ) in (pol d,d′) (1989Ec01,1992Mo17).
@ From 1980Wi12.
& From 1966Ni02.

^{40}Ca(t,t),(pol t,t) 1987En06,1980Ha08,1969Fl06

Measured $\sigma(\theta)$, deduced optical-model parameters.
1987En06: (t,t) E=33 MeV.
1980Ha08: (pol t,t) E=17 MeV. Measured Ay(θ).
1969Fl06: (t,t) E=20 MeV.

^{40}Ca Levels

E(level)	J$^{\pi}$
0	0+

^{40}Ca(^{3}He,^{3}He′) 1967Gi05

Includes (^{3}He,^{3}He).
1967Gi05: E=37.7 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=20° - 95° FWHM=100 keV.
1984Ta11: E=197 MeV. Measured $\sigma(\theta)$.
1982Ta05: E=170 MeV. Measured GQR at E=20 MeV.
1980Le25: E=108.5 MeV. Measured $\sigma(\theta)$, deduced giant- monopole resonance.
1978Ya05: E=120 MeV. Measured σ at θ=1.2°. Deduced isoscalar multipole resonances.
1976Mo07: E=70 MeV. Measured (^{3}He)(p)(θ), (^{3}He)(α)(θ) for giant resonance.
1974Mo13: E=29 MeV. Measured $\sigma(\theta)$, $\theta(\varepsilon M)$=20° - 100°.
1973Mo10: E=71 MeV. Measured $\sigma(\theta)$.
(^{3}He,^{3}He): optical-model parameters from $\sigma(\theta)$ data:.
1986Ab08 (E=10,12,14,16,18 MeV), 1984ChZT (E=132 MeV), 1982Ve13 (E=25 MeV), 1981Gr05 (E=50.4 MeV), 1980Tr02 (E=41 MeV), 1978Ch04 (E=27.7,51.4,73.2,83.5 MeV), 1975Br26 (E=24.5-28 MeV), 1973Wi07 (E=217 MeV), 1973Ro18 (E=8,11 MeV), 1973Mo13 and 1972Mo04 (E=29 MeV), FRNC-TH-443 (1973) (E=7,8,11 MeV), 1971Ur01 (E=21 MeV), 1971Ra35 (E=13 MeV), 1969Zu02 (E=15 MeV), 1965Cl04 (E=8-10.25 MeV).

^{40}Ca Levels

E(level)†	J$^{\pi}$	Γ	L†	β_L‡	Comments
0	0+		0		
3330			0		E(level): average of 1967Gi05 and 1974Mo13. L: from 1974Mo13.
3730			3	0.23	E(level): average of 1967Gi05 and 1978Ya05.
4480			5	0.079	
5250					
5650					
6280			3	0.078	
6590			3	0.062	
6940			2+3		
7950					
8470					
14200		200 keV	0		1978Ya05: α decay to ^{36}Ar g.s. with isotropic angular correlation. 1976Mo07: α decay to ^{36}Ar (g.s.,1970 and 4300 (multiplet)); p decay to ^{39}K (g.s.,2520 and higher levels).
16700		0.90 MeV	(3)		1978Ya05: α decay to ^{36}Ar g.s.
18200		2.2 MeV	2(+0)		1978Ya05: α decay to ^{36}Ar states near 4000. 1976Mo07: α decay to ^{36}Ar (g.s.,1970 and 4300 multiplet); p decay to ^{39}K (g.s.,2520 and higher levels) L; weak L=0 component (1980Le25).

† 1967Gi05, except where noted.
‡ From 1967Gi05.

^{40}Ca(α,α') 1981Va09,1967Li13,1965Sp01

Other main references: 1965Ba03, 1970Sc24, 1974De42, 1981Lu05.
1981Va09: E=120 MeV.
1967Li13, 1966Be19: E=31 MeV.
1966Sp01, 1965Sp01 (also 1966Po03): E=27-40 MeV.
1981Lu05: E=98.5, 116.8, 129.4 MeV; $\sigma(\theta)$.
1974De42: E=24.0, 28.5, 31.0 MeV.
1970Sc24: E=29 MeV; $\sigma(\theta)$, θ=15° - 176°.
1965Ba03: E=30.5 MeV.
1962Be23: E=22 MeV. About 10 a groups reported.
Data for selected levels or giant resonances:.
2003Yo11: E=240 MeV. Measured cross section for isoscalar E0 strength between 6 and 11 MeV at small angles.
2001Yo07, 2001Yo06, 1997Yo07: E=240 MeV; measured $\sigma(\theta)$; deduced E0, E1, E2 widths.
1983Br21: (α,α'), (α,2α) E=120 MeV; $\sigma(\theta)$ at giant resonance. Deduced monopole strength.
1981Yo04: E=99, 117, 129 MeV.
1979Ro09: E=104 MeV; giant resonances at E=13.3-21.8 MeV.
1978Mo10: E=96,115 MeV; giant resonance near E=8.8 MeV.
1978De25: E=40-62 MeV.
1977Al07: E=1.37 MeV.
1976Yo02: E=96, 115 MeV; giant resonance.
1974Ru01 (also 1974RuZS): E=115 MeV; giant resonance.
1973Bi12: E=166 MeV.
1971Ta15: E=166 MeV.
1970Br07: E=44 MeV; $\sigma(\theta)$,θ=15° - 180°.
1968Bu10: E=25 MeV.
1961Sa04: E=44 MeV.
Others:.
1987Se09: E=5-9 MeV.
1985Zw02, 1982Zw01, 1986ZwZZ: (a,≈), (α,2α) E=120 MeV; $\sigma(\theta)$ for giant resonance.
1983VaZX:.
1983Fr03: E=4.4-9.1 MeV.
1981Gu01: E=23-80 MeV.
1980Gi02: E=104 MeV.
1979Ka03:.
1979Ba14: E=1.37 GeV.
1978Se16: E=6-18 MeV.
1978Gu08: E=21-47 MeV.
1978Fr22: E=104 MeV.
1977SmZX: E=30 MeV.
1977Bu15: E=27.2 MeV.
1976Ru02: E=79.1 MeV.
1976Eb03: E=20-26 MeV.
1976Ch19: E=24.4-85.6 MeV.
1976Br11: E=166 MeV.
1975Tr01: E=24-29 MeV.
1975Mo04: E=96.6 MeV.
1975Le19: E=79.1 MeV.
1975Ei04: E=100 MeV.
1974Go22: E=141.7 MeV.
1974Mo22: E=96 MeV.
1974In02: E=40 MeV.
1974RuZS:.
1972St28: E=40.7-72.3 MeV.
1972Oe01: E=24,29 MeV.
1972Br30: E=166 MeV.
1971LeYV: E=166 MeV.
1971Le18: E=18-22 MeV.
1970Fe02: E=42 MeV.
1969La20, 1969La37: E=23 MeV.
1969Jo05 (also 1968JoZZ): E=5.0-12.5 MeV.
1969Ga22: E=18-29 MeV.
1969Be30, 1966Be19: E=29,31 MeV.
1966Gr09: E=27-40 MeV.

1965Ta06: E=22.2 MeV.
1962Sa15: E=43 MeV.

^{40}Ca Levels

E(level)[†]	J^{π}[‡]	Γ	L[†]	$\beta_L R$[a]	Comments
0	0+		0		
3350	0+		0	0.07	
3780	3-		3	0.89 *3*	
3900	2+		2	0.39 *5*	
4480			5	0.43 *5*	
5250[#]			3		
5280[#]					
5620			2	0.17 *5*	L: from 1981Va09. Other: 4 (1965Ba03).
5890			1		L: other: L=3 with β_LR=0.18 (1965Sp01).
6030					
6160			(3)	0.39	E(level): from 1961Sa04 and 1970Br07 only.
6290			3	0.33 *5*	
6510			4		L: from 1970Sc24.
6540			3	0.31	L: from 1965Ba03.
6580[@]			3	0.14	
6740[@]			(3)	0.41	E(level): from 1961Sa04 and 1970Br07 only.
6940					L: several assignments; none adopted by the evaluators.
7120			(6)		L: from 1965Ba03.
7290			0		L: from 1970Sc24. Other: 4 (1965Sp01).
7470[&]					
7570[&]					
7690					E(level): from 1966Be19, 1967Li13 and 1970Sc24.
7900			2	0.33 *4*	L: from 1981Va09. Other: 4 (1965Ba03).
7940			4	0.37 *8*	L: from 1966Be19 and 1967Li13.
8100			2	0.31 *8*	
8290[&]			(2)	0.23	
8380			4	0.29 *6*	L: other: 5 (1965Ba03).
8600			2	0.20	
8790			2	0.17	
8970			(2)	0.13	
9340			3	0.17	
9500					
9870					
10080					
10340			4	0.17	
10590		0.48 MeV *5*	(3)	0.10	L: from 1981Va09. Other: 1 (1981Lu05).
10800			(3)	0.11	
11100			(2)	0.27	
11470			(3)	0.10	
11690			2	0.14	
11940			(2)	0.15	
13450		0.37 MeV *6*	0		L: from 1981Lu05 and 1983Br21 other: 0+2 from α decay to ^{36}Ar g.s. (1982Zw01,1983Br21,1985Zw02).
14450		0.58 MeV *7*	2	0.29	L: other: 0+2 (1979Ro09). S: from 1979Ro09; 0.31 for L=0.
15900		0.63 MeV *10*	3		L: from 1981Lu05. Other: 1+2 (1979Ro09), with β_LR=0.27 for L=1, 0.23 for L=2.
17700		2.31 MeV *20*	2		L: from 1981Lu05, 2001Yo07. Other: 0+2 (1997Yo07). S: other: 2.9 MeV *6* (1997Yo07,2001Yo07).
18200		2.5 MeV *4*	2		L: from 1981Lu05, 1979Ro09, 1976Yo02, 1974Ru01.
19180		4.9 MeV *6*	0		$T_{1/2}$: from 1997Yo07, 2001Yo07.
21000			0+2	0.21,0.20	L: from 1979Ro09.
23360		5.3 MeV *9*	1		$T_{1/2}$: from 1997Yo07, 2001Yo07.

[†] Values are from 1965Ba03, 1965Sp01, 1967Li13, 1970Sc24 and 1974De42 up to 8600; from 1981Va09 for 8600-12000; and from 1981Lu05 for levels above 12000, unless otherwise stated.
[‡] From Adopted Levels.

[#] Only 1974De42 report 5250 and 5280 as separate levels.
[@] Only 1974De42 report 6540 and 6580 as distinct levels.
[&] From 1967Li13.
[a] Unweighted averaged values values are from 1965Sp01, 1967Li13, 1968Bu10, 1970Br07, and 1981Va09. Values for levels above 12000 are from 1974Ru01, 1979Ro09, 1981Lu05 and 2001Yo07 (also 2001Yo06,1997Yo07).

^{40}Ca(α,$\alpha'\gamma$) **1962Be23,1968Ko02**

1962Be23: E=22 MeV. Measured Eγ, $\alpha\gamma$ coin.
1968Ko02: E=31 MeV. Measured Eα, Eγ for 6290, 6560 levels; $\alpha\gamma(\theta)$ for 6940 level.
Others:.
1992Po02: E=120 MeV. Measured $\gamma(\theta)$, $\sigma(\theta)$ for isoscalar dipole strength.
1988Ka21, 1987Ma25: E=13.62 MeV. Measured $\alpha\gamma$ coin, lifetime for 4490 level, g factors for 3740 and 4490 levels.
1979Ni04: E=16.17 MeV. Measured $\alpha\gamma(\theta)$, g-factor for 3740 level.
1976Ja16, 1976Ja20, 1977LiZM: E=16.17 MeV. Measured $\alpha\gamma(\theta$,H); γ-fact0r by recoil in vacuum for 3740 level.
1959Sh62: E=43 MeV. Measured $\alpha\gamma(\theta)$ for 4490 level.

^{40}Ca Levels

E(level)†	J$^{\pi}$‡	$T_{1/2}$	Comments
0	0+		
3730	3-	47.1 ps *21*	g=0.55 *13*. $T_{1/2}$: from 1979Ni04. γ: weighted average of values from 1976Ja16, 1976Ja20 and 1979Ni04; adjusted to $T_{1/2}$=47 ps *2*.
3900			
4480	5-	295 ps *5*	$T_{1/2}$: from 3740γ(t) (1988Ka21,1987Ma25). G(4480)/G(3730)=1.01 *10* (1987Ma25).
5500#			
5700#			
6100#			
6290@	3-@		
6560@	3-@		
6940@	(1-)@		E(level): possible doublet or triplet, but from decay mode and DWBA fit to $\sigma(\theta)$, principally 1- (1968Ko02).
7500#			
8700#			
9600#			

† From 1962Be23, unless otherwise stated.
‡ From Adopted Levels unless otherwise stated.
# From 1962Be23, α group in coin with γ rays.
@ From 1968Ko02.

γ(^{40}Ca)

A_2, A_4, A_6 coefficients are from 1987Ma25.

E_i^{level}	J_i^{π}	E_f^{level}	J_f^{π}	Eγ†	Iγ	Mult.
3730	3-	0	0+	3730	100	
3900		0	0+	3900	100	
4480	5-	3900		580[a]	<10	
		3730	3-	750	100	Q
6290	3-	4480	5-	1810	75 *5*	
		3900		2390	25 *5*	
6560	3-	3900		2660[a]	<10	
		3730	3-	2830	100	
6940	(1-)	3900		3040[a]		
		3730	3-	3210[a]		
		0	0+	6940	60 *10*	

† Level-energy differences.
[a] Weak or non-existent.

^{41}Ca(d,t) 1975Be45

Jπ(^{41}Ca g.s.)=7/2-.
1975Be45: E=40 MeV. Measured $\sigma(\theta)$, FWHM=80 keV DWBA analysis.

^{40}Ca Levels

E(level)	Jπ†	L	C^2S	Comments
0	0+	3	0.79	
3350 *80*	0+	(3)	<0.02	
3740 *80*	3-	0+2	0.16,0.22	
4490 *80*		2	0.58	
5610 *80*		2	0.50	
6030 *80*		(2)	0.10	
6580 *80*		0+2	0.27	S: for L=2.
6750 *80*		2	0.18	
6940 *80*		(2)	0.20	E(level): unresolved triplet: 6930+6940+6950.
7110 *80*		0+2	0.05,0.23	
7675 *80*		2	1.2	E(level): unresolved doublet: 7660+7690.
8450 *80*		2	0.24	E(level): unresolved doublet: 8420+8480.
8550 *80*		2	0.68	
9030 *80*		0	0.15	
10060 *80*		0	0.42	
11220 *80*‡		2	0.8‡	
11700 *80*‡		2	0.4‡	

† From Adopted Levels.
‡ Tentatively assigned as $d_{5/2}$ pickup, since they are too strong to be L=0 (1975Be45).

^{41}Ca(^{3}He,α) 1974Cl08

Jπ(^{41}Ca g.s.)=7/2-.
1974Cl08: E=20 MeV. Measured $\sigma(\theta)$; deduced L, s; DWBA calculations.
Other:.
1975Ap01: E=16, 27 MeV. Measured $\sigma(\theta)$; deduced C2S 0, 3730, 4490 and 5610 levels.
Cross sections given under comments are in mb/sr.

^{40}Ca Levels

E(level)	J$^{\pi\dagger}$	L	C^{2}S	Comments
0	0+	3‡	0.98‡	S: other: 0.92 (1975Ap01). dσ/dΩ(max)=1.65 mb/sr.
3350 *5*	0+	3‡	0.01‡	dσ/dΩ(max)=0.03 mb/sr.
3732 *5*	3-	2	0.57	S: other: 0.65 (unresolved from L=3, 3350 level,1975Ap01). dσ/dΩ(max)=0.59.
4488 *5*	5-	2‡	1.1‡	S: other: 1.2 (1975Ap01). dσ/dΩ(max)=1.20.
5610 *5*		2	0.89	S: other: 0.92 (1975Ap01). dσ/dΩ(max)=1.12.
5901 *5*		2	$<$0.003	dσ/dΩ(max)$<$0.005.
6029 *5*	2-	2‡	0.17‡	dσ/dΩ(max)=0.26.
6288 *5*		2	0.05	dσ/dΩ(max)=0.09.
6583 *5*		0+2	0.04,0.21	dσ/dΩ(max)=0.41.
6748 *5*	2-	2‡	0.22‡	dσ/dΩ(max)=0.31.
6930 *5*		2	0.07	dσ/dΩ(max)=0.10.
6950 *5*		2	0.06	dσ/dΩ(max)=0.13.
7112 *5*		0+2	0.20,0.13	dσ/dΩ(max)=0.66.
7531 *5*		2	0.03	dσ/dΩ(max)=0.04.
7656 *5*		2	1.3	dσ/dΩ(max)=1.93.
7693 *5*		2	1.3	dσ/dΩ(max)=1.88.
8374 *5*		(2)	0.08	dσ/dΩ(max)=0.09.
8423 *5*	2-	2‡	0.62‡	dσ/dΩ(max)=0.82.
8483 *5*		(2)	0.21	dσ/dΩ(max)=0.25.
8551 *5*	5-	2‡	1.7‡	dσ/dΩ(max)=2.14.
9035 *5*		0	0.33	dσ/dΩ(max)=1.47.
9080 *5*		(0)	0.06	dσ/dΩ(max)=0.29.
9145 *5*		(2)	0.11	dσ/dΩ(max)=0.13.
9222 *5*		(2)	0.05	dσ/dΩ(max)=0.08.
9435 *5*		(0)	0.05	dσ/dΩ(max)=0.22.
9460 *5*				dσ/dΩ(max)=0.21.
9559 *5*				dσ/dΩ(max)=0.38.
9605 *5*		(2)	0.31	dσ/dΩ(max)=0.58.
9647 *5*		(2)	$\leq$0.1	dσ/dΩ(max)=0.10.
9673 *5*				dσ/dΩ(max)=0.89.
10055 *5*		0	0.98	dσ/dΩ(max)=6.07.
10214 *5*		0	0.18	dσ/dΩ(max)=0.76.

† From Adopted Levels.
‡ L-value fixed by adopted Jπ considerations.

^{42}Ca(p,t) 1974Se05,1974De20,1972Ad10

Other main references: 1974Se04, 1977SeZR, 1972Sc19, 1969Sm02.
1974Se05 (also 2002SeZQ,1977SeZR,1974Se04): E=40.27 MeV. Measured Q value, $\sigma(\theta)$, cross sections; deduced L.
1974De20 (also 1972DeYF): E=41.7 MeV. Measured $\sigma(\theta)$; deduced L.
1972Ad10: E=41.7 MeV. Measured $\sigma(\theta)$; deduced L.
1972Sc19: E=40 MeV. Measured $\sigma(\theta)$; deduced L.
1969Sm02: E=26.5 MeV. Measured $\sigma(\theta)$; deduced L.
Others:.
1983Sa01: E=40 MeV. Measured $\sigma(\theta)$; deduced L=0 strength.
1979Fr04: E=42,46 MeV. Measured tp and tγ coin for 11980, T=2 state.
1970Mc04, 1970Ha10: E=42-46, 45 MeV. Measured α and proton decay, of 11972, T=2 IAR.
1970He23: E=20 MeV. Measured $\sigma(\theta)$; deduced L.

^{40}Ca Levels

E(level)†	J$^{\pi}$‡	L#	Integrated σ, possibly in mb@	Comments
0	0+	0	64	
3355 *5*	0+	0	14.3	
3738 *5*	3-	3	13.9	
3901 *5*	2+	2	8.1	
4493 *5*		5	4.6	
5208 *10*		0	0.03	
5248 *10*		2	7.1	
5349 *5*				
5623 *5*		2	0.83	
5902 *5*		1	0.28	
6028 *10*			0.62	
6286 *10*		3	0.54	
6507 *5*		4	1.53	
6580 *5*		3	2.13	
6620 *20*				E(level): from 1972Sc19 only.
6752 *5*		(2)	0.44	
6907 *5*		2	1.87	
6950 *5*		1	0.95	
7111 *5*		(3)	0.79	E(level): possibly 7113, 1- and 7114, 4- (evaluators).
7300 *5*		0	0.42	
7430 *5*		(2)	0.30	
7453 *9*				
7473 *5*		2	0.89	
7558 *5*		(2)	2.68	
7620 *5*		0	1.21	
7653 *10*			0.53	
7693 *5*		0	3.0	L: other: 3 (1972Sc19).
7757 *10*			0.06	
7805 *10*			0.08	
7850 *12*				E(level): from 1974De20 only.
7871 *5*		2	0.64	
7925 *5*		(3)	0.76	
7978 *10*			0.26	
8025 *10*		0	0.22	
8085 *5*		4	1.05	
8113 *10*				
8192 *10*		(2)	0.59	
8279 *10*		0	0.29	
8338 *10*			0.26	
8375 *5*		4	0.95	
8430 *5*		0	1.40	
8483 *10*		0	0.28	
8547 *5*		5	3.2	
8578 *5*			0.57	
8663 *10*		4	0.18	
8752 *10*		3	0.28	

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^{40}Ca Levels (continued)

E(level)†	Jπ‡	L#	Integrated σ, possibly in mb@	Comments
8853 *10*			0.18	
8905 *10*		(6)	0.48	
8939 *5*		0	0.19	
8983 *10*				
9033 *5*			1.22	
9110 *20*				E(level): from 1972Sc19 only.
9157 *5*			0.46	
9250 *10*			0.12	
9263 *10*		(2)	0.31	
9304 *5*		0	0.52	
9366 *10*		2	0.55	
9405 *5*		0	3.8	
9569 *10*			0.13	
9592 *10*				
9620 *15*				
9665 *10*			0.88	
11972 *12*		0		%α=100 1979Fr04,1970Mc04. T=2 IAR state (1979Fr04,1970Mc04). L: from 1974Se05. 93% *9* α decay to ^{36}Ar g.s.; <3% α decay to first 2+ in ^{36}Ar; <5% p decay to ^{39}K g.s. (1979Fr04). Others: 1970Mc04, 1970Ha10.

† Weighted average from 1977SeZR, 1974De20, 1972Ad10 and 1972Sc19.
‡ From Adopted Levels.
\# From 1974Se05, 1977SeZR and 1974De20.
@ From 2002SeZQ.

^{42}Ca(^{16}O,^{18}O) 1976Ei02

1976Ei02: E=56 MeV. Measured σ(θ), θ(εM)=4° - 70°; finite range DWBA analysis.

^{40}Ca Levels

E(level)	Jπ	L	dσ/dΩ (max) (μb/sr)
0	0+	0	120

(HI,xnγ) 2001Id01,2004To07,1976Na15

Includes reactions ^{28}Si(^{24}Mg,3αγ); ^{28}Si(^{20}Ne,2αγ); ^{28}Si(^{14}N,pnγ); ^{27}Al(^{19}F,α2nγ); ^{27}Al(^{16}O,p2nγ); ^{27}Al(^{14}N,nγ); ^{24}Mg(^{24}Mg,2αγ); ^{24}Mg(^{19}F,p2nγ); ^{36}Ar(^{16}O,^{12}Cγ).

2001Id01: ^{28}Si(^{20}Ne,2αγ) E=84 MeV. Measured Eγ, γγ, γα coin, γ(θ), lifetimes by DSAM using gammasphere array of 101 Compton-suppressed Ge detectors and microball 4π array of 95 CsI(Tl) scintillation counters.

2004To07: ^{28}Si(^{24}Mg,3αγ): E=139 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO) using GASP array and charged-particle ball ISIS. Deduced negative parity bands.

1976Na15: ^{28}Si(^{14}N,pnγ) E=36 MeV. Measured γ, γγ, nγ coin, γγ(θ), lifetimes by DSA and recoil-distance methods.

1975Si12: ^{28}Si(^{14}N,pnγ) E=34 MeV. Measured γ(θ), γγ(θ).

2003Ch22: ^{24}Mg(^{24}Mg,2αγ) E=92 MeV. Measured Eγ, Iγ, γγ, lifetimes using Doppler-shift attenuation analyses; deduced transition quadrupole moments for SD band.

Others:.

1976Po03: ^{27}Al(^{19}F,α2nγ) E=40 MeV. Measured γγ, lifetimes by recoil-distance method.

1974Wa07: ^{24}Mg(^{19}F,p2nγ) E=20-45 MeV; ^{27}Al(^{16}O,p2nγ) E=20-45 MeV; ^{27}Al(^{14}N,nγ) E=20-45 MeV. Measured γ.

1973Te04: ^{36}Ar(^{16}O,^{12}Cγ) E=58 MeV. Measured (^{12}C)γ coin. Three levels reported: g.s., 3904, 5278.

All data are from 2001Id01, unless otherwise stated.

^{40}Ca Levels

Nuclear Level Sequences

A 4p-4h, 0+ band. Q(intrinsic)=0.74 *14* from lifetime data corresponding to $\beta_2\approx0.27$.

B Yrast band.

C 3+ band.

D Kπ=0- band (2004To07). 2004To07 propose this band as a partner of 4p-4h band based on 3353,0+ state; the 1-, 3- and 5- members of this band are proposed at 5902, 1-; 6280, 3- or 6580, 3-; and 7399, (5-), respectively. The 5902, 6280 and 6580 levels are seen in other reaction.

E SD band (2001Id01,2003Ch22). Q(transition)=1.30 *15* for one value assumed over the whole band. For separated fits for high-spin and low-spin states, Q(transition)=1.81 *+46-33* and Q(transition)=1.18 *+14*, respectively (2003Ch22). Corresponding β_2=0.59 *+13-9* for high-spin and 0.40 *4* for low-spin states. Q(transition)=1.80 *+39-29* from lifetime data (2001Id01), corresponding to β_2=0.59 *+11-7*. Configuration=8p-8h defined by $\pi3^4\nu3^4$, where superscripts are the number of protons and neutrons occupying the N=3 ($f_{7/2}$) intruder orbital.

Seq.	E(level)†	Jπ‡	$T_{1/2}$	Comments
	0	0+		
A	3351.9 *8*	0+		
	3736.3 *3*	3-		
A	3904.4 *3*	2+		
	4491.2 *4*	5-	0.38 ns *8*	$T_{1/2}$: from recoil-distance method (1976Po03).
E	5211.4 *11*	0+		
	5248.5 *6*	2+		
A	5278.8 *4*	4+		
	5613.3 *8*	4-		
E	5631.2 *8*	2+		
C	6029.4 *9*	3+		
	6508.5 *12*	4+		
E	6543.9 *7*	4+		
A	6931.4 *6*	6+	0.34 ps *+9-17*	$T_{1/2}$: from DSA (1976Na15).
C	7398.4 *8*	(5+)		E(level): 2004To07 propose this level as the 5- member of negative-parity band, based on systematics. These authors do not find any feeding transition to this level.
	7677.2 *8*	(6+)		
E	7974.4 *8*	(6+)		
B	8100.3 *6*	8+	12.5 ps *17*	$T_{1/2}$: recoil-distance method (1976Na15).
	8701#	(6-)		
C	8935.8 *9*	(7+)		
D	9033#	(7-)		
A	9305.2 *8*	(8+)		
E	9853.5 *8*	(8+)		
	10474#	(8-)		

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^{40}Ca Levels (continued)

Seq.	E(level)†	Jπ‡	$T_{1/2}$	Comments
D	10895#	(9-)		
B	11003.0 *9*	(10+)		
A	11685.8 *9*	(10+)		
C	11708.7 *12*	(9+)		
E	12334.9 *10*	(10+)		
	12591.9 *10*	(10+)		
D	12923#	(11-)		
B	13115.1 *10*	12+		
	13195#	(10-)		
C	13535.5 *13*	(11+)		
A	14232.4 *10*	(12+)		
B	15152.4 *12*	(13+)		Jπ: 14+ in figure 5 of 2004To07.
E	15267.1 *14*	(12+)		
D	15306#	(13-)		
	15748.1 *14*	(12+)		
A	16529.4 *12*	(14+)		
C	16579.7 *16*	(13+)		
	17698.6 *14*	(14+)		
	18054.6 *14*	(14+)		
D	18215#	(15-)		
E	18497.2 *17*	(14+)		
E	18719.2 *17*	(14+)		
B	19195.6 *16*	(15+)		
A	20578.6 *15*	(16+)		
E	22060.4 *20*	(16+)		

† From least-squares fit to Eγ's, assuming 1 keV uncertainty when not stated.
‡ As proposed by 2001Id01, 2003Ch22 and 2004To07. For low-spin levels (J<6), assignments are from Adopted Levels; higher spins are from angular correlation data and band assignments, the parentheses are added by the evaluators.
# From 2004To07.

γ(^{40}Ca)

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	Mult.‡	Comments
3351.9	0+	0	0+	3352.3[a]		
3736.3	3-	0	0+	3736.1 *3*[c]	E3	DCO=1.5 *5* (2004To07).
3904.4	2+	3351.9	0+	553		
		0	0+	3904.0 *3*[b]	Q	
4491.2	5-	3736.3	3-	754.8 *2*[c]	Q	DCO=1.0 *2*. DCO=1.29 *15* (1975Si12).
5211.4	0+	3904.4	2+	1307[a]		
5248.5	2+	3904.4	2+	1343		
		0	0+	5249		
5278.8	4+	4491.2	5-	787		
		3904.4	2+	1374.3 *3*[b]	(Q)	A_2=+0.41 *5* (A_4=-0.075 assumed) (1976Na15). DCO=1.00 *16* (1976Na15).
5613.3	4-	4491.2	5-	1122[d]		
		3736.3	3-	1877[d]		
5631.2	2+	0	0+	5632[e]		
6029.4	3+	5248.5	2+	781		
6508.5	4+	5248.5	2+	1260		
6543.9	4+	5631.2	2+	914		
		5248.5	2+	1295	(Q)	
		3904.4	2+	2640[e]	(Q)	
6931.4	6+	5278.8	4+	1652.4 *4*[d]	E2	A_2=+0.27 *7* (A_4=-0.075 assumed) (1976Na15). DCO=0.82 *24* (1975Si12), 1.17 *20*, 1.58 *25* (1976Na15).

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

E_i^{level}	J_i^π	E_f^{level}	J_f^π	E_γ†	Mult.‡	Comments
7398.4	(5+)	6029.4	3+	1369	(Q)	
		5278.8	4+	2120	(D)	
7677.2	(6+)	5278.8	4+	2398	(Q)	
7974.4	(6+)	6543.9	4+	1432	(Q)	
		5278.8	4+	2695[e]	(Q)	
8100.3	8+	6931.4	6+	1168.7 *3*[b]	E2	DCO=0.95 *14*, 1.09 *14*, 1.07 *18* (1976Na15).
8701	(6-)	5613.3	4-	3088[f]		
		4491.2	5-	4209[f]		
8935.8	(7+)	7398.4	(5+)	1538	(Q)	
		6931.4	6+	2004	(D)	
9033	(7-)	4491.2	5-	4542[f]		
9305.2	(8+)	7677.2	(6+)	1628[e]	(Q)	
		6931.4	6+	2375[e]	(Q)	
9853.5	(8+)	7974.4	(6+)	1880	(Q)	
		7677.2	(6+)	2176[e]	(Q)	
		6931.4	6+	2921[e]	(Q)	
10474	(8-)	8701	(6-)	1773[f]		
10895	(9-)	9033	(7-)	1862[f]	(Q)	DCO=1.2 *4* (2004To07).
11003.0	(10+)	9305.2	(8+)	1698	(Q)	
		8100.3	8+	2902	(Q)	
11685.8	(10+)	9305.2	(8+)	2381	(Q)	
		8100.3	8+	3585	(Q)	
11708.7	(9+)	8935.8	(7+)	2773	(Q)	
12334.9	(10+)	9853.5	(8+)	2481[e]	(Q)	
		9305.2	(8+)	3030[e]	(Q)	
12591.9	(10+)	9305.2	(8+)	3287	(Q)	
		8100.3	8+	4491	(Q)	
12923	(11-)	10895	(9-)	2028[f]		DCO=0.4 *3* (2004To07).
13115.1	12+	11685.8	(10+)	1429	(Q)	
		11003.0	(10+)	2112	(Q)	
13195	(10-)	10895	(9-)	2300[f]		
13535.5	(11+)	11708.7	(9+)	1827	(Q)	
14232.4	(12+)	11685.8	(10+)	2547[e]	(Q)	
		11003.0	(10+)	3229	(Q)	
15152.4	(13+)	13535.5	(11+)	1617	(Q)	
		13115.1	12+	2037	(D)	
15267.1	(12+)	12334.9	(10+)	2932[e]	(Q)	
15306	(13-)	12923	(11-)	2383[f]		DCO=1.2 *6* (2004To07).
15748.1	(12+)	12591.9	(10+)	3156	(Q)	
16529.4	(14+)	14232.4	(12+)	2297	(Q)	
		13115.1	12+	3414	(Q)	
16579.7	(13+)	13535.5	(11+)	3044	(Q)	
17698.6	(14+)	14232.4	(12+)	3466	(Q)	
18054.6	(14+)	14232.4	(12+)	3822	(Q)	
18215	(15-)	15306	(13-)	2909[f]		
18497.2	(14+)	15267.1	(12+)	3230	(Q)	
18719.2	(14+)	15267.1	(12+)	3452[e]	(Q)	
19195.6	(15+)	15152.4	(13+)	4043	(Q)	
20578.6	(16+)	16529.4	(14+)	4049[e]	(Q)	
22060.4	(16+)	18497.2	(14+)	3563	(Q)	

† From 2001Id01 in (^{20}Ne,2$\alpha\gamma$) reaction; unless otherwise stated.

‡ The authors state that $\gamma(\theta)$ data are consistent with stretched quadrupole transitions (assumed as ΔJ=2, E2) for most γ rays, except for 2004, 2037 and 2120 which are assigned as ΔJ=1, dipole. Results of $\gamma(\theta)$ measurements are not quoted in 2001Id01.

[a] From level-energy difference.

[b] From 1975Si12.

[c] From 1974Wa07.

[d] From 1976Na15.

[e] From 2003Ch22, value quoted by 2001Id01 is in agreement.
[f] From 2004To07.

$^{40}_{21}Sc_{19}$ $^{40}_{21}Sc_{19}$

Adopted Levels

Q(β^-)=-11.67×10^3 *16*; S(n)=14427 *24*; S(p)=538 *3*; Q(α)=-5522 *8* 2003Au03
Q(εp)=5994.8 *28* (2003Au03).
Other reactions:.
^{40}Ca(γ,π^-): 1985To14, 1982To10: E=400 MeV. Measured σ, deduced pion production. 1973Gr21: E=340 MeV. Measured σ.
^{40}Ca(π^+,π): 1987Bo43, 1986Ir02, 1986Er09, 1984Er03, 1984Bo51, 1983Ba13, 1982Ba50: E=120, 165, 230 MeV. Measured $\sigma(\theta)$.
^{40}Ca(π+,π+π^-): 2001Ca53, 2000Bo38, 2000Gr28, 1999Bo25, 1997Bo15, 1996Bo09: E=283 MeV, measured pion invariant mass spectra.
^{40}Ca(^{6}Li,^{6}He): 1974Ga11: E=38 MeV. Upper limits on cross sections estimated for excitation energy up to 1700 as: <2.5 μb for 10° <0.4 μb for 30°. No peaks were observed in ^{6}He spectra.
^{40}Ca(^{6}Li,^{6}He): 1980GuZW: E=92 MeV. Measured σ, deduced T=1 magnetic giant resonance. Details of this study are not available.
Delayed 2-proton radioactivity of ^{42}Cr to levels in ^{40}Sc is possible but none has been detected by 2001Gi01. An unexplained proton group at 2490 *30* from ^{42}Cr decay could be an L=0 *2*-proton transition from IAS to first excited 0+ state in ^{40}Sc, but no γ rays were observed.
In (^{12}C,^{12}B), 1988Vo06 identify population of 1+ states in 4.9-5.0 MeV region at low angles; a 6- state near 6 MeV at larger angles; and strong low-lying states of unnatural parity characterized by L=1, L=3 and L=5 transitions giving rise to 2-, 4- and 6- states, respectively. Population of a spin-flip dipole resonance (Jπ=0-,1-,2-) is suggested by strong enhancement of cross section in the 7-15 MeV range.
All levels populated in ^{40}Ti ε decay are proton unbound.

^{40}Sc Levels

Cross Reference (XREF) Flags

A	^{40}Ti ε decay (53.3 ms)
B	^{40}Ca(^{3}He,t)
C	^{40}Ca(^{12}C,^{12}B)
D	^{40}Ca(p,n),(pol p,n)

E(level)	Jπ†	T$_{1/2}$	XREF	Comments
0	4-	182.3 ms *7*	BCD	%ε+%β+=100 . %εp=0.44 *7*. %$\varepsilon\alpha$ =0.017 *5*. Jπ: log *ft*=4.67 to 5-; log *ft*=4.80 to 3- (see ^{40}Sc ε decay). %$\varepsilon\alpha$, %εp: from 1982Ho09. T$_{1/2}$: weighted average of 179 ms *2* (1962Sc08), 186 ms *4* (1966An01), 182.7 ms *8* (1968Ar03), and 183 ms *3* (1972Mo08).
34.3 *15*	(3-)		BCD	Jπ: $\sigma(\theta)$ in (^{3}He,t).
772.1 *16*	(2-)		BCD	Jπ: $\sigma(\theta)$ in (^{3}He,t).
893.5 *20*	(5-)		BCD	Jπ: $\sigma(\theta)$ in (^{3}He,t).
1670.7 *19*	(1-&2-)		B	Jπ: from $\sigma(\theta)$ for a possible triplet.
1703.2 *22*			B	
1797.0 *24*	(3-)		B	Jπ: from $\sigma(\theta)$.
1871 *3*			B	
1933 *3*			B	
2285 *8*	1+		A	

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^{40}Sc Levels (continued)

E(level)	$J^{\pi\dagger}$	$T_{1/2}$	XREF	Comments
2370 *4*	(4-)		B D	Jπ: σ(θ) in (p,n) for a complex structure and σ(θ) in (^{3}He,t). In higher-energy (^{3}He,t) experiments of 1984Ta11, a 1+ level at 2370 is proposed from σ(θ) data with the speculation that this state may be the analog of T=1 *10310*, 1+ state or T=1 *9400*, 0+ state in ^{40}Ca.
2754 *8*	1+		A D	Ref: D: 2700.
2940 *11*	1+		A	
3030	(3-)		B	Jπ: from σ(θ).
3144 *17*	1+		AB	Ref: β: 3140.
3230 *60*	1+		A	
3337 *17*	1+		AB	Ref: β: 3360.
3418 *60*	1+		AB	Ref: β: 3450.
3494 *8*			AB	E(level): uncertain in ε decay. Ref: α: 3542.
3656 *9*	1+		A	
3790 *9*	1+		A	
3864 *41*			A	
3.9×10^3 *1*	(1-,2-)		D	Jπ: from σ(θ) for a complex structure.
4070 *22*	1+		A	
4132 *20*	1+		A	
4271 *9*	1+		A D	E(level): complex structure in (p,n). Ref: D: 4300.
4368 *8*	0+		A	T=2 . Jπ: log *ft*=3.26 from 0+; IAS of ^{40}Ti g.s.
4526 *12*	1+		A	
4658 *11*	1+		A	
4830 *19*	1+		A	
4904 *15*			A	
5018 *21*	1+		A	
5086 *28*	1+		A	
5228 *28*			A	
5362 *60*	1+		A	
5574 *40*	1+		A	
5702 *23*	1+		A	
6012 *28*	1+		A	
6127 *60*	1+		A	
6426 *60*	1+		A	
7.5×10^3 *25*	(6-)		D	Jπ: from σ(θ) for a complex structure.
9×10^3 *3*	(0-,1-,2-)		D	Jπ: from σ(θ) for a complex structure.

† 1+ assignments are from log *ft*<5.2 from 0+.

^{40}Ti ε decay (53.3 ms) 1998Bh12,1998Li46,1990De43

Parent: ^{40}Ti: E=0; Jπ=0+; $T_{1/2}$=53.3 ms *15*; Q=11.67×10^3 *16*; %ε=100

^{40}Ti decays to ^{39}Ca by εp (≈100%).

1998Bh12 (also 1998Le45,1997Tr11), 1998Li46 (also 2001Li56,1997Li25): measured E(p), I(p), pγ coin, $T_{1/2}$. 1998Bh12 measure pβ coin also.

1990De43: ^{40}Ti isotope identified and four proton groups.

2001Gi01 (also 2001Gi02): four most intense proton groups reported. Also measured $T_{1/2}$.

^{40}Sc Levels

E(level)†	Jπ‡	E(p)(lab)#	Comments
0	4-		Jπ: from Adopted Levels.
2285 *8*	1+	1702 *6*@	
2754 *8*	1+	2160 *6*@	
2940 *11*	1+	2341 *10*	
3144 *17*	1+	2542 *16*	
3230 *60*	1+	2609 *60*&	E(level): average from two proton groups at 2609 *60* and 242 *80* S: E(p)=242 *80* (in 1998Li46 only) to 2468.7 level in ^{39}Ca.
3337 *17*	1+	2728 *16*	
3418 *60*	1+	400 *60*&	S: proton group to 2468.7 level in ^{39}Ca.
3542 *40*		2928 *40*	S: average from 1998Bh12 and 1998Li46.
3656 *9*	1+	3039 *8*	
3790 *9*	1+	3179 *8*	S: E(p)=747 *36* to 2468.7 level in ^{39}Ca.
3864 *41*		3242 *41*[a]	
4070 *22*	1+	3443 *21*	
4132 *20*	1+	3487 *25*	E(level): average from two proton groups. S: E(p)=1111 *20* to 2468.7 level in ^{39}Ca.
4271 *9*	1+	3639 *8*	
4368 *8*	0+	3733 *7*@	T=2 . S: E(p)=1325 *7* to 2468.7 level in ^{39}Ca.
4526 *12*	1+	3887 *11*	S: E(p)=951 *86* (1998Li46 only) to 3026 level in ^{39}Ca.
4658 *11*	1+	4017 *11*	S: E(p)=1608 *17* to 2468.7 level in ^{39}Ca.
4830 *19*	1+	4184 *18*	
4904 *15*		1849 *14*[ab]	S: proton group to 2468.7 level in ^{39}Ca.
5018 *21*	1+	4371 *23*	E(level): average from two proton groups. S: E(p)=1957 *21* to 2468.7 level in ^{39}Ca.
5086 *28*	1+	4433 *31*	S: E(p)=2027 *28* to 2468.7 level in ^{39}Ca.
5228 *28*		4572 *28*[a]	
5362 *60*	1+	4702 *60*&	
5574 *40*	1+	4909 *40*&	
5702 *23*	1+	5034 *22*	
6012 *28*	1+	5336 *28*	
6127 *60*	1+	5448 *60*&	
6426 *60*	1+	5740 *60*&	

† Deduced from proton energies. See details in ^{40}Ti εp decay for ^{39}Ca.

‡ For excited states, the assignments are from allowed β decays from 0+ as indicated by log *ft* values.

From 1998Bh12, except where noted otherwise. Values from 1998Li46 are in general agreement but less precise due to poorer resolution than in 1998Bh12, although the source purity is claimed as better by 1998Li46.

@ Weighted average from 1998Bh12, 1998Li46 and 2001Gi01.

& From 1998Li46 only.

[a] From 1998Bh12 only.

[b] This proton group is considered as suspect by the evaluators. With I(p)=1.4 in 1998Bh12, this group should have been seen by 1998Li46. In addition 1998Bh12 do not list, in their table III, a level at 4904 in ^{40}Sc corresponding to this proton group.

ε,β^+ radiatons

Eε	E(level)	Iε	Log *ft*	I(ε+β⁺)	Comments
(5.24E+3)	6426	0.00026 *15*	4.8 *3*	0.11 *6*‡	av Eβ=1934 *83*. εK=0.0021 *3*. CL=0.00022 *3*. εM+=3.7×10^{-5} *5*.
(5.54E+3)	6127	0.00035 *20*	4.8 *3*	0.18 *10*‡	av Eβ=2079 *84*. εK=0.00175 *22*. CL=0.000176 *22*. εM+=3.0×10^{-5} *4*.
(5.66E+3)	6012	0.00038 *13*	4.74 *17*	0.21 *7*	av Eβ=2135 *80*. εK=0.00163 *19*. CL=0.000163 *19*. εM+=2.8×10^{-5} *4*.
(5968)	5702	0.00036 *14*	4.81 *18*	0.24 *9*	av Eβ=2286 *79*. εK=0.00134 *14*. CL=0.000135 *14*. εM+=2.30×10^{-5} *24*.
(6.10E+3)	5574	0.00022 *14*	5.0 *3*	0.16 *10*‡	av Eβ=2349 *81*. εK=0.00124 *13*. CL=0.000125 *13*. εM+=2.13×10^{-5} *22*.
(6.31E+3)	5362	0.0007 *3*	4.59 *18*	0.55 *21*‡	av Eβ=2453 *84*. εK=0.00110 *12*. CL=0.000111 *12*. εM+=1.89×10^{-5} *20*.
(6.44E+3)	5228	0.00013 *13*	5.3 *5*	0.11 *11*	av Eβ=2518 *80*. εK=0.00102 *10*. CL=0.000103 *10*. εM+=1.75×10^{-5} *17*.
(6.58E+3)	5086	0.0009 *3*	4.49 *14*	0.86 *23*	av Eβ=2588 *80*. εK=0.00095 *9*. CL=9.5×10^{-5} *9*. εM+=1.62×10^{-5} *15*. *I*(ε+β⁺): 0.42 *20* from E(p)=4436 and 0.44 *11* from E(p)=2027.
(6652)	5018	0.0014 *3*	4.31 *11*	1.4 *3*	av Eβ=2621 *80*. εK=0.00091 *9*. CL=9.2×10^{-5} *9*. εM+=1.56×10^{-5} *14*. *I*(ε+β⁺): 0.53 *23* from E(p)=4369 and 0.86 *26* from E(p)=1957.
(6766)	4904	0.0013 *3*	4.35 *11*	1.4 *3*	av Eβ=2677 *79*. εK=0.00086 *8*. CL=8.7×10^{-5} *8*. εM+=1.47×10^{-5} *13*.
(6840)	4830		4.66 *12*	0.72 *17*	av Eβ=2713 *80*.
(7012)	4658	0.0017 *3*	4.28 *9*	2.0 *3*	av Eβ=2798 *79*. εK=0.00076 *7*. CL=7.6×10^{-5} *7*. εM+=1.30×10^{-5} *11*. *I*(ε+β⁺): 1.59 *23* from E(p)=4017 and 0.38 *18* from E(p)=1604.
(7144)	4526	0.0021 *4*	4.21 *9*	2.6 *4*	av Eβ=2863 *79*. εK=0.00071 *6*. CL=7.2×10^{-5} *6*. εM+=1.22×10^{-5} *10*. *I*(ε+β⁺): 1.8 *3* from E(p)=3887 and 0.8 *3* from E(p)=4540.
(7302)	4368	0.0191 *16*	3.26 *6*	25.8 *8*†	av Eβ=2940 *79*. εK=0.00066 *6*.

Continued on next page (footnotes at end of table)

ε,β^{+} radiatons (continued)

Eε	E(level)	Iε	Log *ft*	$I(\varepsilon+\beta^{+})$	Comments
					CL=6.6×10^{-5} *6*. εM+=1.13×10^{-5} *9*. $I(\varepsilon+\beta^{+})$: 21.8 *5* from E(p)=3733 and 4.0 *6* from E(p)=1325.
(7399)	4271	0.00145 *19*	4.39 *7*	2.05 *22*	av Eβ=2988 *79*. εK=0.00063 *5*. CL=6.3×10^{-5} *5*. εM+=1.08×10^{-5} *9*.
(7538)	4132		4.82 *11*	0.86 *19*	av Eβ=3056 *80*. $I(\varepsilon+\beta^{+})$: 0.33 *14* from E(p)=3487 and 0.53 *13* from E(p)=1116.
(7600)	4070		5.14 *15*	0.43 *14*	av Eβ=3087 *80*.
(7.81E+3)	3864		5.8 *5*	0.11 *11*	av Eβ=3188 *82*.
(7880)	3790	0.00147 *17*	4.44 *7*	2.58 *23*	av Eβ=3225 *79*. εK=0.00051 *4*. CL=5.1×10^{-5} *4*. εM+=8.7×10^{-6} *7*. $I(\varepsilon+\beta^{+})$: 2.09 *23* from E(p)=3169 and 0.49 *17* from E(p)=750.
(8014)	3656		4.66 *7*	1.73 *20*	av Eβ=3291 *79*.
(8.13E+3)	3542		5.08 *20*	0.7 *3*	av Eβ=3347 *82*.
(8.25E+3)	3418		5.12 *20*	0.7 *3*‡	av Eβ=3408 *85*.
(8333)	3337		5.22 *14*	0.58 *17*	av Eβ=3448 *80*.
(8.44E+3)	3230	0.0011 *3*	4.64 *12*	2.4 *6*‡	av Eβ=3501 *85*. εK=0.00040 *3*. CL=4.1×10^{-5} *3*. εM+=6.9×10^{-6} *5*. $I(\varepsilon+\beta^{+})$: 1.1 *4* from E(p)=2609 and 1.3 *4* from E(p)=242.
(8526)	3144		5.08 *11*	0.91 *21*	av Eβ=3544 *80*.
(8730)	2940		4.82 *11*	1.9 *4*	av Eβ=3644 *80*.
(8916)	2754	0.0111 *8*	3.67 *5*	29.6 *7*†	av Eβ=3736 *80*. εK=0.000336 *21*. CL=3.37×10^{-5} *22*. εM+=5.7×10^{-6} *4*.
(9385)	2285	0.0075 *5*	3.89 *5*	23.6 *6*†	av Eβ=3968 *80*. εK=0.000283 *17*. CL=2.84×10^{-5} *17*. εM+=4.8×10^{-6} *3*.

† Weighted average from 1998Bh12, 1998Li46 and 2001Gi01.
‡ From 1998Li46 only.

^{40}Ca(p,n),(pol p,n) 1986Ch19

Includes (pol p,pol n).
1986Ch19, 1987Wa31, 1986Wa28, 1986ChZQ: (pol p,n) E=134 MeV. Measured $\sigma(\theta)$, analyzing power, polarization transfer coefficients. Deduced levels. FWHM=220-415 keV. Time-of-flight method.
2002Ha14: (pol p,n) E=197 MeV.
2002Wa06, 1999Wa08: (pol p,pol n): E=346 MeV. Measured σ and analyzing power.
1996Wa09, 1994Wa24: (pol p,pol n) E=135 MeV. Measured $\sigma(\theta)$, deduced isovector spin-dipole resonances.
1994Ta24, 1993Ch13: (pol p,pol n) E=494 MeV. Measured polarization transfer coefficients, deduced isovector spin response.
1994Sa36: (pol p,n) E=50, 80 MeV. Measured polarization transfer coefficients.
1987Ra23: (p,n) E=7-9 MeV. Measured thick target γ and neutron yields.
1984NaZX: (p,n) E=119.3 MeV. Measured σ, deduced strength for for 1+ states.
1983Ta16: (p,n) E=59.3, 118.3, 159.3 MeV. Measured $\sigma(\theta)$, deduced Gamow-Teller transition strengths.
1983An06: (p,n) E=133.5 MeV. Measured $\sigma(\theta)$, deduced levels.
1981Ga26: (p,n) E=200 MeV. Measured $\sigma(\theta)$, deduced resonances.
1980KnZX: (p,n) E=60, 135 MeV. Measured $\sigma(\theta)$.
1969Ov01, 1966Br17: (p,n) E=2-20 MeV. Measured σ, deduced Q value.
2001Ka19: (pol p,n): calculations and comparison with data.

^{40}Sc Levels

E(level)[†]	J^{π}[‡]	L	Comments
0[@]	4-		
30[@]	(3-)		
770[@]	(2-)		Strongly populated state.
890[@]	(5-)		
2.3×10^3 *1*[#]	(4-)	3	
2.7×10^3 *1*	1+		
3.9×10^3 *1*[#]	(1-,2-)		
4.3×10^3 *1*[#]	1+		
7.5×10^3 *25*[#]	(6-)		
9×10^3 *3*[#]	(0-,1-,2-)	1	

[†] From 1986Ch19, uncertainty is ≈100 keV.
[‡] From Adopted Levels.
[#] Complex structure.
[@] 0+30 and 770+890 form unresolved structures.

$^{40}Ca(^{3}He,t)$ 1971Sc02,1971Lo16,2000Ha06

1971Sc02: E=28 MeV. Measured $\sigma(\theta)$, FWHM=15 keV, deduced levels.
1971Lo16: E=30.2 MeV. Measured $\sigma(\theta)$, FWHM=20 keV for 0+34 and 70 keV for higher levels deduced levels, comparison with DWBA calculations.
2000Ha06: E=26.064, 26.076 MeV. Measured triton spectra at FWHM=15 keV. Deduced levels.
1991Gr03: E=75 MeV. Measured σ at 0°, deduced isovector giant resonances.
1991Br20 (also 1988Ro17):E=0.9-2 GeV. Measured $\sigma(\theta)$, deduced spin multipole Gamow-Teller transition strengths.
1984Va43: E=75, 81 MeV. Measured $\sigma(\theta)$, deduced transition strengths.
1984Ta11:E=197 MeV. Measured σ $T_{1/2}$ 15°, deduced levels, giant-dipole resonance, isovector GQR analog.
1982Ta05: E=130, 170 MeV. Measured $\sigma(\theta)$, deduced GQR and IAS of T=1 GDR.
1966Ma58: measured Q value.

^{40}Sc Levels

E(level)[†]	Jπ[‡]	σ(relative)[b]	Comments
0[a]	4-	1.5	
34.3 *15*[a]	(3-)	1.6	
772.1 *16*[a]	(2-)	2.0	
893.5 *20*[a]	(5-)	5.2	
1670.7 *19*	(1-&2-)	1.2	E(level): possibly a triplet (1971Sc02).
1703.2 *22*[@]			
1797.0 *24*	(3-)	1.0	
1871 *3*[@]			
1933 *3*[@]			
2370 *4*[a]		6.1	E(level): a peak at 2370 is reported by 1982Ta05. Possible Jπ=1+ from small L-transfer suggested by $\sigma(\theta)$ data of 1984Ta11 who speculate that this state may be the analog of T=1 *10310*, 1+ state or T=1 *9400*, 0+ state in ^{40}Ca. $\sigma(\theta)$ data of 1971Lo16 suggests 4-.
3030[#]	(3-)		
3140[#]			
3360[#]			
3450[#&]		0.5	
3494 *8*[&]			E(level): from 1971Sc02 only.
12.9×10^{3} *37*			E(level): gDR (1984Ta11,1982Ta05).

[†] Weighted averages of 1971Sc02 and 2000Ha06.
[‡] From comparison of $\sigma(\theta)$ patterns with DWBA calculations (1971Lo16). All assignments are the same in Adopted Levels.
[#] From 1971Lo16 only.
[@] From 2000Ha06 only.
[&] 3450 in 1971Lo16 and 3494 in 1971Sc02 may correspond to the same level.
[a] Reported in high-energy experiments of 1984Ta11, 1982Ta05 also.
[b] At 40° (1971Sc02).

^{40}Ca(^{12}C,^{12}B) 1988Vo06

1988Vo06: E=70 MeV/nucleon. Measured $\sigma(\theta)$. FWHM≈300 keV.

^{40}Sc Levels

1988Vo06 identify population of 1+ states in 4.9-5.0 MeV region at low angles; a 6- state near 6 MeV at larger angles; and strong low-lying states of unnatural parity characterized by L=1, L=3 and L=5 transitions giving rise to 2-, 4- and 6- states, respectively. Population of a spin-flip dipole resonance (Jπ=0-,1-,2-) is suggested by strong enhancement of cross section in the 7-15 MeV range.

E(level)	Jπ†	L
0‡	4-	(3)
30‡	(3-)	
740#	(2-)	(1)
890#	(5-)	

† As proposed by 1988Vo06, parentheses are added by the evaluators. All assignments are the same in Adopted Levels.
‡ g.s. and 30 form a weak unresolved group.
# 740 and 890 are unresolved and form a dominant structure in the spectrum.

Adopted Levels

S(n)=18420 *SY*; S(p)=1.97×10^3 *16*; Q(α)=-4.84×10^3 *16* 2003Au03
Q(β^-)=-19180 *530* (syst,2003Au03), Δ(S(n))=260 (syst,2003Au03).
Q(εp)=11140 *160* (2003Au03).
Mass excess=-9060 *10* (1998Bh12, IMME (isobaric mass multiplet equations). This method not considered very certain by 2003Au03.
^{40}Ti produced in the following studies:.
1990De43: ^{58}Ni(^{58}Ni,X) E=65 MeV/nucleon. Magnetic analysis of fragments and time-of-flight method.
1998Bh12 (also 1998Le45,1997Tr11): Ni(^{50}Cr,X) E=82.6 MeV/nucleon. Fragments were separated by LISE3 spectrometer.
1998Li46 (also 2001Li56,1997Li25): ^{9}Be(^{58}Ni,X) E=500 MeV/nucleon followed by isotopic separation by projectile fragment recoil separator.

^{40}Ti Levels

Cross Reference (XREF) Flags

A ^{40}Ca(π^+,π^-)

E(level)	J$^\pi$	$T_{1/2}$	XREF	Comments
0	0+	53.3 ms *15*	A	%ε+%β+=100 . %εp=100 1998Bh12,1998Li46. %β^+ delayed γ activity <3% from integrated β strength of 99.0% *16* (1998Bh12) and 101% *5* (1998Li46). Integrated β strength in ^{40}Ti ε decay is 103.4 *22* (evaluator). No β^+ delayed γ activity was seen by 1998Li46. $T_{1/2}$: weighted average of 53.5 ms *25* (2001Gi01,2001Gi02), 52.7 ms *15* (1998Bh12,1998Le45, 51.7 ms *6* in 1997Tr11), 54 ms *2* (1998Li46, 55 ms *2* in 1997Li25), and 56 ms *+18-12* (1990De43).

^{40}Ca(π^+,π^-) 1997Fo09,1995Si01,1990Mo02

In most of the following studies, $\sigma(\theta)$ were measured for the excitations of nonanalog g.s. in ^{40}Ti deduced in a double charge-exchange reaction.
1997Fo09: E=45-90 MeV, measured $\sigma(\theta)$, deduced g.s. transitions resonance structure.
1995Si01: E=32-79.26 MeV, measured $\sigma(\theta)$, deduced core polarization.
1991Wa04, 1982Mo12: E=164 MeV. Measured $\sigma(\theta)$.
1991Mo05, 1990Mo02: E=295 MeV, measured $\sigma(\theta)$, deduced double- isovector GDR.
1989Gr06: E=180, 240 MeV. Measured total σ.
1985Mo18, 1983Bl08: E=120-210 MeV, measured $\sigma(\theta)$.
1979Da16: E=290 MeV. Measured σ.

^{40}Ti Levels

E(level)	J$^\pi$	Comments
0	0+	dσ/dΩ=0.60 μb/sr 16 at E(π+)=64.19 MeV and 30° (1995Si01).