Nuclear Data Sheets for A = 41*

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Abstract: Available information pertaining to the nuclear structure of all nuclei with mass numbers A=41 ranging from Al (Z=13) to Ti (Z=22) are presented. The experimental reaction and decay data are evaluated and any inconsistencies or discrepancies are noted. The adopted values for various level properties (such as the spin, parity and half-life) and gamma properties (energy, intensity and multipole character) are given.

Since the prior evaluation several new measurements have expanded our knowledge of A=41 nuclides. The half-life of the ground state of ^{41}Si has been determined and a single excited state identified. Excited levels in ^{41}P have been observed for the first time. In ^{41}Cl , seven new excited states have been identified in deep inelastic and heavy ion transfer reactions. Half-lives for four states in ^{41}Ar have been updated and additional levels with gammas have been included from a new measurement using the multiple ion transfer reaction. In ^{41}Ca via charge-exchange reaction measurements, several new excited states were observed. A number of new resonances in ^{41}K have been identified via the (p, γ) reaction.

There remains a significant discrepancy in the half-life of the first excited state (980 keV) in ^{41}K , with measurements differing by more than an order of magnitude. Transfer reactions suggest that this M1 transition should be l-forbidden, however, several measurements yield a lifetime which suggests a sizable M1 strength. Further measurements to resolve the current conflicts would be beneficial.

General Policies and Organization of Material: see <http://www.nndc.bnl.gov/nds/NDSPolicies.pdf>.

General Comments: This work supersedes the 2001 evaluation by John A. Cameron and Balraj Singh (2001Ca59)

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Skeleton Scheme for A=41

S(p) 22010^{SY}
S(α) 21680^{SY}

S(n) 2160^{SY}
0.0
41
13Al₂₈
100%
Q⁺=21770^{SY}

S(n) 1380⁴⁴⁰
0.0
20.0 ms
41
14Si₂₇
100%
Q⁺=17100³⁸⁰

S(n) 4980¹⁴⁰
0.0
101 ms
41
15P₂₆
100%
Q⁺=14030⁸⁰

S(n) 4242⁶
0.0
1.99 s
41
16S₂₅
100%
Q⁺=8300⁷⁰

(1/2+) 0.0
38.4 s
41
17Cl₂₄
100%
Q⁺=5760⁷⁰

7/2- 0.0
109.61 min
41
18Ar₂₃
100%
Q⁺=2492.0³

3/2+ 0.0
41
19K₂₂

Skeleton Scheme for A=41 (continued) **Ground-State and Isomeric-Level Properties**

Nuclide	Level	$J\pi$	$T_{1/2}$	Decay Modes
^{41}Al	0.0			$\% \beta^-=100$; $\% \beta^-n=?$
^{41}Si	0.0		20.0 ms 25	$\% \beta^-=100$; $\% \beta^-n>0$
^{41}P	0.0		101 ms 5	$\% \beta^-=100$; $\% \beta^-n=30 \text{ } 10$
^{41}S	0.0		1.99 s 5	$\% \beta^-=100$; $\% \beta^-n=?$
^{41}Cl	0.0	(1/2+)	38.4 s 8	$\% \beta^-=100$
^{41}Ar	0.0	7/2-	109.61 min 4	$\% \beta^-=100$
^{41}K	0.0	3/2+	stable	
^{41}Ca	0.0	7/2-	$9.94 \times 10^4 \text{ y}$ 15	$\% \epsilon=100$
^{41}Sc	0.0	7/2-	596.3 ms 17	$\% \epsilon+\% \beta^+=100$
^{41}Ti	0.0	3/2+	81.9 ms 5	$\% \epsilon+\% \beta^+=100$; $\% \epsilon p=100$
^{42}Cr	0.0	0+	13.3 ms 10	$\% \epsilon p=94.4 \text{ } 50$; ...
^{43}Cr	0.0	(3/2+)	21.2 ms 7	$\% \epsilon 2p=11.6 \text{ } 10$; ...

Adopted Levels

$Q(\beta^-)=21770$ SY; $S(n)=2160$ SY; $S(p)=22010$ SY; $Q(\alpha)=-21680$ SY 2012Wa38.

$\Delta Q(\beta^-)=700$; $\Delta S(n)=780$; $\Delta S(p)=840$; $\Delta Q(\alpha)=850$ (2012Wa38).

$S(2n)=3250$ syst 780; $Q(\beta^-n)=20390$ syst 639 (2012Wa38).

2011FuZZ: $\text{Be}({}^{48}\text{Ca}, X)$ with $E({}^{48}\text{Ca})=345$ MeV/nucleon. Isotopes separated with the BigRIPS in-flight separator and identified through Bp, time-of-flight, and energy loss measurements. Measured production cross section for ${}^{41}\text{Al}$ as $\sigma=10^{-8}$ mb (value extracted from Figure 1 by evaluators).

1997Sa14: ${}^{181}\text{Ta}({}^{48}\text{Ca}, X)$ with $E({}^{48}\text{Ca})=70$ MeV/nucleon. Isotopes separated with the fragment separator RIPS and identified through Bp, time-of-flight, energy loss, and total kinetic energy measurements. A total of 4 events were observed for ${}^{41}\text{Al}$. Subset of results given in 1997SaZV.

 ${}^{41}\text{Al}$ Levels

E(level)	Comments
0 . 0	<p>$\% \beta^- = 100$; $\% \beta^- n = ?$</p> <p>E(level): assuming observed events correspond to the ground state.</p> <p>$J\pi$: $3/2+$ proposed from systematics (2012Au07); $3/2+$ or $5/2+$ from shell model calculations (2013Li39).</p> <p>$T_{1/2}$: theoretical calculations give 3.6 ms (2003Mo09) and 5.1 or 5.9 ms (2013Li39).</p> <p>$\% \beta^- n$: theoretical calculations give $\% \beta^- n = 40$ (2003Mo09) and 65 (2013Li39).</p>

Adopted Levels, Gammas

Q(β⁻)=17100 380; S(n)=1380 440; S(p)=23140 SY; Q(α)=-18600 SY 2012Wa38.
ΔS(p)=620; ΔQ(α)=620 (2012Wa38).
S(2n)=6.3×10³ 4; S(2p)=44730 syst 630; Q(β⁻n)=1.21×10⁴ 4 (2012Wa38).
2011FuZZ: Be(⁴⁸Ca,X) with E(⁴⁸Ca)=345 MeV/nucleon. Isotopes separated with the BigRIPS in-flight separator and identified through Bp, time-of-flight, and energy loss measurements. Measured production cross section for ⁴¹Si as σ=10⁻⁴ mb (value extracted from Figure 1 by evaluators).
2007Ta15: ⁹Be(⁴⁸Ca,X) and natW(⁴⁸Ca,X) reactions with E(⁴⁸Ca)=142 MeV/nucleon. Fragments separated with the A1900 fragment separator and identified using ΔE, Bp, total energy and time-of-flight measurements. Measured production cross section for ⁴¹Si as σ=1.3×10⁻⁵ mb +6-8 for the W target.
2004Gr20: ⁹Be(⁴⁸Ca,X) reaction with E(⁴⁸Ca)=60 MeV/nucleon. Fragments separated with the LISE3 spectrometer and identified on a event-by-event basis using ΔE and time-of-flight measurements. Measured implant-β(t); deduced T_{1/2}. Subset of results given in 2004Gr28, 2003Gr22.
1999YoZW: ⁹Be(⁴⁸Ca,X) and ¹⁸¹Ta(⁴⁸Ca,X) reactions with E(⁴⁸Ca)=70 MeV/nucleon. Fragments separated with the RIPS spectrometer and identified by measuring time-of-flight and energy deposition into two Si detectors. Measured implant-β(t) using a Si detector and β-neutron coincidences using 46 ³He proportional counters; deduced preliminary T_{1/2} values and tentative β-delayed neutron emission probabilities.
1989Gu03: ¹⁸¹Ta(⁴⁸Ca,X) reaction with E(⁴⁸Ca)=55 MeV/nucleon. Fragments separated by the achromatic LISE spectrometer and identified using ΔE, total energy, Bp, and time-of-flight measurements. Established particle stability of ⁴¹Si.

⁴¹Si Levels

Cross Reference (XREF) Flags

A ⁹Be(⁴²P,Xγ),(⁴³S,Xγ),(⁴⁴S,Xγ)

E(level)	XREF	T _{1/2}	Comments
0.0	A	20.0 ms 25	%β=100; %β ⁻ n>0. T _{1/2} : from implant-β(t) (2004Gr20). Other: 15 ms 5 (preliminary value from implant-β(t) in 1999YoZW, read off graph in Figure 1 by evaluators). Jπ: 7/2- proposed from systematics (2012Au07), 3/2- from shell model calculations (2011Ka03). %β ⁻ n: preliminary result of 103 43 is given in 1999YoZW; a value greater than 100% indicates multiple neutron emission events were observed. As authors state their %β ⁻ n values are tentatively deduced, the value is not adopted here. Theoretical calculations give %β ⁻ n=45 (2003Mo09).
672 14	A		

γ(⁴¹Si)

E(level)	Eγ	Iγ
672	672 14	100

⁹Be(⁴²P,Xγ),(⁴³S,Xγ),(⁴⁴S,Xγ) 2011So22

Secondary beams of ⁴²P, ⁴³S and ⁴⁴S were produced through ¹²C(⁴⁸Ca,X) and ¹⁸¹Ta(⁴⁸Ca,X) reactions with E(⁴⁸Ca)=60 MeV/nucleon, selected using the SSSI device coupled to the α spectrometer, and identified through ΔE and time-of-flight measurements. ⁴¹Si was produced in the 1p, 2p and 2p1n reaction channels from ⁴²P, ⁴³S and ⁴⁴S secondary beams, respectively, on a Be target, selected using the SPEG spectrometer and identified through ΔE, time-of-flight and Bp measurements. Measured Eγ, Iγ using the 4π Chateau de Crystal array consisting of 74 BaF₂ scintillators. Production cross section for the 2p knockout from the ⁴³S secondary beam at 41.5 MeV/nucleon was determined to be 71 μb 14.

⁴¹Si Levels

E(level)
0.0
672 14

$^9\text{Be}(^{42}\text{P},\text{X}\gamma),(^{43}\text{S},\text{X}\gamma),(^{44}\text{S},\text{X}\gamma)$ 2011So22 (continued)

$\gamma(^{41}\text{Si})$

$E\gamma$	E(level)	Comments
672 14	672	$E\gamma$: given the observed width of the transition, it may be possible that it includes the decay of the triplet predicted by the shell model (2011So22).

Level Scheme

Adopted Levels, Gammas

$Q(\beta^-)=14030$ 80; $S(n)=4980$ 140; $S(p)=17700$ 240; $Q(\alpha)=-1.721\times 10^4$ 14 2012Wa38.

$S(2n)=8290$ 120; $S(2p)=40554$ syst 510; $Q(\beta^-n)=9790$ 80 (2012Wa38).

2004Gr20: $^9\text{Be}(^{48}\text{Ca},X)$ reaction with $E(^{48}\text{Ca})=60$ MeV/nucleon. Fragments separated with the LISE3 spectrometer and identified on an event-by-event basis using ΔE and time-of-flight measurements. Measured implant- $\beta(t)$; deduced $T_{1/2}$. Subset of results given in 2004Gr28, 2003Gr22.

1989Le16: $^{181}\text{Ta}(^{48}\text{Ca},X)$ reaction with $E(^{48}\text{Ca})=55$ MeV/nucleon. Fragments separated with the LISE spectrometer and identified through ΔE and time-of-flight measurements. Measured $\beta(t)$, β -n coincidences; deduced $T_{1/2}$ and β^-n .

 ^{41}P Levels**Cross Reference (XREF) Flags**

A $^9\text{Be}(^{44}\text{S},X\gamma)$

E(level) [†]	XREF	$T_{1/2}$	Comments
0.0	A	101 ms 5	$\beta^-n=100$; $\beta^-n=30$ 10. $T_{1/2}$: weighted average of 100 ms 5 from implant- $\beta(t)$ (2004Gr20) and 120 ms 20 from $\beta(t)$ (1989Le16). Others: 150 ms 15 (1998WiZV), 1999YoZW. β^-n : from 1989Le16. Other: 71 21 (1999YoZW, preliminary value). $J\pi$: 1/2+ proposed from both systematics (2012Au07) and shell model calculations (2007Ba47), 3/2+ from relativistic mean field model (2014Wa34).
172 11	A		$J\pi$: shell model calculations predict 3/2+ for a level at 235 keV (2007Ba47).
1145 17	A		$J\pi$: shell model calculations predict 5/2+ for levels at 990 keV and 1025 keV (2007Ba47).
1574 19	A		$J\pi$: shell model calculations predict 3/2+ for a level at 1400 keV (2007Ba47).

[†] From a least-squares fit to $E\gamma$, by evaluators.

 $\gamma(^{41}\text{P})$

E(level)	$E\gamma^{\dagger}$
172	172 12
1145	964 22
	1146 28
1574	420 22
	1408 19

[†] From $^9\text{Be}(^{44}\text{S},x\gamma)$.

 $^9\text{Be}(^{44}\text{S},X\gamma)$ 2007Ba47

^{44}S secondary beam with $E(^{44}\text{S})=39$ MeV/nucleon produced in fragmentation of ^{48}Ca primary beam with $E(^{48}\text{Ca})=60$ MeV/nucleon, separated with the ALPHA spectrometer and identified through time-of-flight and ΔE measurements. Secondary ^9Be target placed at the entrance of the SPEG spectrometer and recoils identified using ionization and drift chambers to measure ΔE and position and a plastic scintillator to determine time-of-flight and total energy. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using an array of 74 BaF_2 crystals.

 ^{41}P Levels

E(level) [†]	Comments
0.0	$J\pi$: shell model calculations predict $J\pi=1/2+$ for the ground state (2007Ba47).
172 11	$J\pi$: shell model calculations predict $J\pi=3/2+$ for a level at 235 keV (2007Ba47).
1145 17	$J\pi$: shell model calculations predict $J\pi=5/2+$ for levels at 990 and 1025 keV (2007Ba47).
1574 19	$J\pi$: shell model calculations predict $J\pi=3/2+$ for a level at 1400 keV (2007Ba47).

[†] From a least-squares fit to $E\gamma$, by evaluators.

$^9\text{Be}(^{44}\text{S},\text{X}\gamma)$ 2007Ba47 (continued)

 $\gamma(^{41}\text{P})$

E_γ		$E(\text{level})$
172	12	172
420	22	1574
964	22	1145
1146	28	1145
1408	19	1574

Level Scheme

Adopted Levels, Gammas

$Q(\beta^-)=8300\ 70$; $S(n)=4242\ 6$; $S(p)=18220\ 110$; $Q(\alpha)=-1.484\times 10^4\ 8$ 2012Wa38.
 $S(2n)=11990\ 50$; $S(2p)=35910\ 90$; $Q(\beta^-n)=480\ 30$ (2012Wa38).

 ^{41}S LevelsCross Reference (XREF) Flags

A ^{41}P β^- Decay (101 ms)
 B Coulomb Excitation
 C $^{208}\text{Pb}(^{36}\text{S},X\gamma)$

E(level) [†]	XREF	T _{1/2}	Comments
0.0	BC	1.99 s 5	% β^- =100; % β^-n =? T _{1/2} : from 1998WiZV. Other: 2.6 s 14 (1995ReZZ). J π : (7/2-) predicted by particle-rotor model calculations (1999Ib01), (5/2-) predicted by shell model calculations (2011Wa13).
449 2	BC		B(E2) $\uparrow$ =0.0167 65 (1999Ib01). J π : (5/2-) predicted by particle-rotor model calculations (1999Ib01), (7/2-) predicted by shell model calculations (2011Wa13). B(E2) $\uparrow$: assigned as E2 transition by 1999Ib01 based on systematics of transition strengths in this mass region; E1 transition cannot be ruled out.
904 16	B		B(E2) $\uparrow$ =0.0232 56 (1999Ib01). J π : (9/2-) proposed in 1999Ib01 based on particle-rotor model calculations. B(E2) $\uparrow$: assigned as E2 transition by 1999Ib01 based on systematics of transition strengths in this mass region; E1 transition cannot be ruled out.
1087? 3	C		J π : (11/2-) proposed by 2011Wa13 based on population characteristics of multi-nucleon transfer reactions.

[†] From E γ .

 $\gamma(^{41}\text{S})$

E(level)	E γ [†]	Comments
449	449 2	
904	904 16	E γ : from Coulomb Excitation. A 903.5 γ is reported in ^{41}P β^- decay (1998WiZV).
1087?	638 $\frac{1}{2}$ 2	E γ : placed as yrast transition feeding the 449-keV level, however, possibility that transition feeds the ground state cannot be ruled out.

[†] From $^{208}\text{Pb}(^{36}\text{S},X\gamma)$, except where noted.

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

 ^{41}P β^- Decay (101 ms) 1998WiZV

Parent ^{41}P : E=0.0; J π =?; T_{1/2}=101 ms 5; Q(g.s.)=14030 80; % β^- decay=100.

^{41}P activity from fragmentation of a ^{48}Ca beam with E=70 MeV/nucleon and 80 MeV/nucleon. Fragments separated with the A1200 separator and implanted into Al targets. Measured E γ , γ - β coincidences using two HPGe and a thin plastic scintillator.

Main γ rays from the decay of ^{41}P are listed by 1998WiZV, but no level scheme is available. ^{41}P also decays to ^{40}S by β^-n with % β^-n =30 10 (1989Le16).

Other: 1989Le16.

 $\gamma(^{41}\text{S})$

E γ [†]
^x 329.1 7
^x 501.9 7
^x 569.6 7
^x 903.5 $\frac{1}{2}$ 7
^x 1307.5 7
^x 1613.7 7

Footnotes continued on next page

^{41}P β^- Decay (101 ms) 1998WiZV (continued)

$\gamma(^{41}\text{S})$ (continued)

[†] From 1998WiZV.

[‡] Possibly the same as a 904γ observed in Coulomb excitation.

^x γ ray not placed in level scheme.

Coulomb Excitation 1999Ib01

$^{197}\text{Au}(^{41}\text{S}, ^{41}\text{S}')$ with $E(^{41}\text{S})=47.4$ MeV/nucleon. ^{41}S beam produced by fragmentation of a ^{48}Ca beam with $E=70$ MeV/nucleon on a ^9Be target. Fragments separated in the A1200 separator and identified through energy loss and TOF measurements. Measured $E\gamma$, $I\gamma$ with an array of 38 cylindrical NaI(Tl) detectors and scattered beam- γ coincidences using a fast/slow plastic phoswich detector.

1999Ib01 consider systematics of transition strengths in this mass region and argue that the observed transitions observed correspond to E2 transitions since 1) the largest known M1 transition strengths result in cross sections comparable to the slowest E2 transitions and 2) with E1 strengths commonly on the order of 10^{-4} W.u. it is expected that no strong E1 excitations would be observed. However, they also state that since large E1 strengths are observed in ^{29}P and ^{30}P , E1 excitations cannot be completely ruled out.

^{41}S Levels

E(level) [†]	Comments
0.0	$J\pi$: (7/2-) proposed by 1999Ib01 based on particle-rotor model calculations (1999Ib01).
449 8	$B(E2)\uparrow=0.0167$ 65.
	$J\pi$: (5/2-) proposed by 1999Ib01 based on particle-rotor model calculations (1999Ib01).
904 16	$B(E2)\uparrow=0.0232$ 56.
	$J\pi$: (9/2-) proposed by 1999Ib01 based on particle-rotor model calculations (1999Ib01).

[†] From $E\gamma$.

$\gamma(^{41}\text{S})$

<u>$E\gamma$</u>	<u>E(level)</u>
449 8	449
904 16	904

Level Scheme

$^{208}\text{Pb}(^{36}\text{S},\text{X}\gamma)$ 2011Wa13

$E(^{36}\text{S})=215$ MeV. Projectile-like fragments selected with the magnetic spectrometer PRISMA placed 56° to the beam axis. Measured $E\gamma$, $I\gamma$, fragment- γ coincidence using the CLARA array consisting of 22 Compton-suppressed HPGe clover detectors.

The ordering of the 449γ and 638γ is based on comparison to Coulomb excitation results and the assumption that Yrast states are predominately populated in deep-inelastic processes. The absence of a strong 638γ in Coulomb excitation indicates that this transition does not correspond to an E2 transition directly connected to the ground state.

 ^{41}S Levels

<u>$E(\text{level})^\dagger$</u>	<u>$J\pi^\ddagger$</u>
0.0	(5/2-)
449 2	(7/2-)
1087? 3	(11/2-)

† From $E\gamma$.

‡ Based on comparison to shell model calculations and the assumption that Yrast states are preferentially populated in deep-inelastic reactions.

 $\gamma(^{41}\text{S})$

<u>$E\gamma$</u>	<u>$E(\text{level})$</u>
449 2	449
638 † 2	1087?

† Placement of transition in the level scheme is uncertain.

Level Scheme

Adopted Levels, Gammas

$Q(\beta^-)=5760\ 70$; $S(n)=7820\ 80$; $S(p)=11760\ 70$; $Q(\alpha)=-10740\ 80$ 2012Wa38.

$S(2n)=3251\ \text{syst}\ 780$; $Q(\beta^-n)=-340\ 70$ (2012Wa38).

2006Wi10: β^-n decay of ^{42}S to ^{41}Cl , no definite evidence exists from measurements. An upper limit was set for $\beta^-n < 1$ from intensity of a 167γ . Other: $\beta^-n < 4$ (1995So03).

1981HuZT: $T_{1/2}$ via beta decay of ^{41}Cl produced by bombarding 600 MeV protons on uranium that was measured with a precise quartz crystal oscillator.

1974Gu10: $T_{1/2}$ via beta decay of ^{41}Cl produced in the three nucleon transfer reaction $^{181}\text{Ta}(^{40}\text{Ar}, ^{41}\text{Cl})$.

1971Ar32: ^{41}Cl first identified in $^{232}\text{Th}(^{40}\text{Ar}, X)$ reaction at $E=290$ MeV. Identified using magnetic analysis and the $\Delta E-E$ technique with two Si detectors.

 ^{41}Cl Levels**Cross Reference (XREF) Flags**

- A $^{41}\text{S}\ \beta^-$ Decay (1.99 s)
 B $^{160}\text{Gd}(^{37}\text{Cl}, X\gamma)$
 C $^{176}\text{Yb}(^{36}\text{S}, X\gamma)$
 D $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}$	Comments
0.0 §	(1/2+)	ABCD	38.4 s 8	$\beta^- = 100$. $J\pi$: From probable allowed β feeding to 1/2+ levels in ^{41}Ar and from 2013Sz02 based on an analogy with ^{37}Cl and ^{39}Cl where the yrast 5/2+ level decays only to the 3/2+ and not to the 1/2+ level. $T_{1/2}$: from 1981HuZT. Other: 34 s 3 (1974Gu10).
129.70 § 10	(3/2+)	ABCD		$J\pi$: From 2013Sz02 based on an analogy with ^{37}Cl and ^{39}Cl where the yrast 5/2+ level decays only to the 3/2+ and not to the 1/2+ level.
891.44 § 22	(5/2+)	ABCD		
1445.1 § 5	(7/2+)	A CD		
1475.0 3	(5/2-, 7/2-)	D		$J\pi$: From 2013Sz02 based on an analogy with ^{39}Cl . Note that the 7/2- alternative would require the 1346 γ to be M2.
2210.3 § 4	(9/2+)	D		
2451.3 § 10	(11/2+)	CD		$J\pi$: (9/2+) in $^{176}\text{Yb}(^{36}\text{S}, X\gamma)$ (2003Ol03, 2004Ol05).
2716.9 6	(9/2-, 11/2-)	D		

[†] From least-squares fits to $E\gamma$'s for levels populated in the multiple transfer reaction $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$.

[‡] Except as noted, assignments are based on yrast population arguments in the deep inelastic scattering reaction $^{176}\text{Yb}(^{36}\text{S}, X\gamma)$ (2003Ol03, 2004Ol05) and multiple nucleon transfer reaction $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$ (2013Sz02) both of which have been compared with shell model calculations. Negative parity states are from comparison with states in ^{39}Cl from $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$ (2013Sz02).

§ (A): Yrast structure.

 $\gamma(^{41}\text{Cl})$

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$
129.70	129.7 1	100
891.44	761.7 2	100
1445.1	553.7 4	100
1475.0	583.5 2	42 4
	1346 1	100 33
2210.3	735.1 3	100
2451.3	1006.1 8	100
2716.9	506.3 4	83 17
	1244 1	100 33

[†] From $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$.

Adopted Levels, Gammas (continued)

(A) Yrast structure

^{41}S β^- Decay (1.99 s) 1998WiZV

Parent ^{41}S : $E=0$; $J\pi=?$; $T_{1/2}=1.99$ s 5; $Q(\text{g.s.})=8300$ 70; $\%\beta^-$ decay=100.

$^{41}\text{S}-Q(\beta^-)$: From 2012Wa38.

1998WiZV: ^{41}S produced from projectile fragmentation of ^{48}Ca on Be target at NSCL and separated using the A1200 fragment separator. Ions were identified with a Si detector and then implanted on Al targets that were attached to a rotatable wheel. Ge and thin plastic β detectors were used for $E\gamma$, $\gamma\gamma$ -coin and $\beta\gamma\gamma$ -coin measurements. Beam on/beam off and beam line tuning allowed γ rays to specific decays and the β decay half-life to be measured. Main γ rays from the decay of ^{41}S are listed by 1998WiZV, but no level scheme is available from these authors. The evaluators have placed 130.2 γ , 761.0 γ and 553.6 γ based on reaction work of 2002Li55, 2003O103.

 ^{41}Cl Levels

E(level)	$J\pi^\dagger$
0.0	(1/2+)
130.2 7	(3/2+)
891.2 10	(5/2+)
1444.8 12	(7/2+)

† From Adopted Levels.

 $\gamma(^{41}\text{Cl})$

$E\gamma^\ddagger$	E(level)
130.2 $\frac{7}{2}$	130.2
553.6 $\frac{7}{2}$	1444.8
761.0 $\frac{7}{2}$	891.2
^x 1266.2 7	
^x 1404.8 7	

† From 1998WiZV.

‡ Placement by the evaluators based on reaction data from 2002Li55, 2003O103, and 2013Sz02.

^x γ ray not placed in level scheme.

Decay Scheme

$^{160}\text{Gd}(^{37}\text{Cl},\text{X}\gamma)$ 2002Li55

2002Li55: Deep inelastic reaction with $E(^{37}\text{Cl})=234$ MeV beam on ^{160}Gd . Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using EUROBALL IV array of Ge detectors. γ -ray transitions were gated within the yrast sequence of the complimentary fragments of ^{152}Gd and ^{154}Gd .

 ^{41}Cl Levels

E(level)	$J\pi^\dagger$
0.0 ‡	(1/2+)
130 ‡	(3/2+)
891 ‡	(5/2+)

† Proposed by authors (2002Li55) based on the selective population of yrast states seen in ^{37}Cl and ^{39}Cl and the γ -ray intensities.

‡ (A): Yrast states.

 $\gamma(^{41}\text{Cl})$

$E\gamma^\dagger$	E(level)	$I\gamma$
130	130	445 6
761	891	281 6

† Energy peak of 554 keV was observed in 2002Li55 but has been assigned to ^{152}Gd by the authors. However, subsequent works of 2003O103 and 2004O105 in $^{176}\text{Yb}(^{36}\text{S},\text{X}\gamma)$ associate the 554 keV peak with ^{41}Cl .

Level Scheme

Intensities:
relative $I\gamma$

$^{176}\text{Yb}(^{36}\text{S},\text{X}\gamma)$ 2003O103,2004O105

2004O105,2003O105: Deep inelastic reaction with $E(^{36}\text{S})=230$ MeV beam on ^{176}Yb . Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using GASP array of 40 HPGe detectors and 80 BGO crystals. Comparison with shell-model calculations. Both papers are from the same group.

 ^{41}Cl Levels

E(level)	$J\pi^\dagger$	Comments
0.0 ‡	(1/2+)	
130 ‡	(3/2+)	
891 ‡	(5/2+)	
1445 ‡	(7/2+)	
2451 ‡	(11/2+)	$J\pi$: (9/2+) proposed by 2003O103, 2004O105.

† From Adopted Levels.

‡ (A): Yrast structure.

$^{176}\text{Yb}(^{36}\text{S},\text{X}\gamma)$ 2003O103,2004O105 (continued) $\gamma(^{41}\text{Cl})$

E_γ	E(level)	I_γ
130	130	
554	1445	628 37
761	891	
1006	2451	223 28

Level Scheme

Intensities: relative
 I_γ

$^{208}\text{Pb}(^{40}\text{Ar},\text{X}\gamma)$ 2013Sz02

2013Sz02: 1p removal and 2n addition. $E(^{40}\text{Ar})=255$ MeV beam provided by the ECR ion source and accelerated by the superconducting ALPI-Linac accelerator at Laboratory Nazionali di Legnaro. Target= $300 \mu\text{g}/\text{cm}^2$ ^{208}Pb . Measured fragments, E_γ , I_γ , time-of-flight, energy loss, $\gamma\gamma$ -, (fragment) γ -coin using the Clara array and magnetic spectrometer Prisma. Deduced Doppler corrected E_γ , levels, J , π . Comparison with large-scale shell-model calculations.

 ^{41}Cl Levels

$E(\text{level})^\dagger$	$J\pi$
0.0	(1/2+)
129.70 10	(3/2+)
891.44 22	(5/2+)
1445.1 5	(7/2+)
1475.0 3	(5/2-, 7/2-)
2210.3 4	(9/2+)
2451.3 10	(11/2+)
2716.9 6	(9/2-, 11/2-)

† From least-squares fit to E_γ data.

 $\gamma(^{41}\text{Cl})$

E_γ	E(level)	$I_\gamma^\dagger$
129.7 1	129.70	190 20
506.3 4	2716.9	50 10
553.7 4	1445.1	120 20
583.5 2	1475.0	100 10
735.1 3	2210.3	100 10
761.7 2	891.44	270 20
1006.1 8	2451.3	100 20
1244 1	2716.9	60 20
1346 1	1475.0	240 80

† Effective number of counts after taking into account detector efficiency. I_γ from 2013Sz02 divided by 10.

$^{208}\text{Pb}(^{40}\text{Ar},\text{X}\gamma)$ 2013Sz02 (continued)

Level Scheme

 Intensities: relative I γ

Adopted Levels, Gammas

Q(β⁻)=2492.0 3; S(n)=6098.9 3; S(p)=12800 30; Q(α)=-8596.0 4 2012Wa38.

⁴¹Ar Levels

⁴⁰Ar+n resonance work (1991Wi02) is not included in Adopted Levels, 206 resonances below E(n)=1520 keV (6110-7580 excitation energy in ⁴¹Ar) were reported with energies, Jπ's and gΓ_n values. See ⁴⁰Ar(n,n): resonances dataset for details.

Cross Reference (XREF) Flags

A ⁴¹Cl β⁻ Decay (38.4 s)
 B ⁴⁰Ar(n,γ),(pol n,γ) E=thermal
 C ⁴⁰Ar(d,p),(pol d,p),²H(⁴⁰Ar,p)
 D ⁴⁰Ar(d,pγ),²H(⁴⁰Ar,pγ)
 E ⁴⁰Ar(¹³C,¹²C)
 F ⁴⁰Ar(n,γ) E=res
 G ²⁰⁸Pb(⁴⁰Ar,Xγ)

E(level) [#]	Jπ [‡]	XREF	T _{1/2} [†]	Comments
0.0	7/2-	ABCDEFGG	109.61 min 4	%β=100. T _{1/2} : Weighted average of 109.64 min 4 (1990Ab06), 109.32 min 12 (1986Ru09), 109 min 2 (1971Ju04), 109.8 min 12 (1964Pa03), 110 min 1 (1952Ka44), 109.6 min 4 (1951Ha78), 109.4 min 10 (1946Bl28), 110 min 1 (1936Sn01). Others: 109.31 min (2014Bh09), 103.5 min 24 (1969Bo11), 111 min 1 (1956Sc91), 107 min 3 (1950Br29). μ=-1.309 8 (2008Bl01). Q=-0.042 4 (2008Bl01). μ,Q: From collinear fast beam laser spectroscopy-accelerated beam. See compilation in 2014StZZ and recommended Q in 2013StZZ. Jπ: L(pol d,p)=3 and γ from (9/2-). Jπ: L(pol d,p)=3 and γ from 1/2-.
167.11 9	5/2-	ABCDEFGG	315 ps 15	T _{1/2} : From advanced time delayed βγγ(t) method in ⁴¹ Cl β- decay (2007Wh01). Others: 410 ps 30 (1966Fo12), >3.5 ps (1977Sc11).
515.77 15	3/2-§	ABCD FG	0.26 ns 8	T _{1/2} : From advanced time delayed βγγ(t) method in ⁴¹ Cl β- decay (2007Wh01). Others: 340 ps 20 (1966Fo12), >2.8 ps (1977Sc11).
1033.94 16	3/2+	ABCD FG	5 ps +28-3	T _{1/2} : from 4.5 ps +277-26 from τ=6.5 +400-37 (1978Ra13). Other: >2.8 ps (1977Sc11).
1353.71 11	3/2-§	ABCDEFGG	0.40 ps 6	Jπ: L(pol d,p)=2. T _{1/2} : From weighted average of 0.44 ps 6 from τ=0.64 ps +9-8 (1977Sc11) and 0.32 ps 8 from τ=0.46 ps 12 (1978Ra13). Other: <100 ps (1966Fo12).
1504.8 6	(9/2-)	G		Jπ: Agrees with shell model calculations in ²⁰⁸ Pb(⁴⁰ Ar, Xγ).
1629.7 3	(11/2-)	G		Jπ: Agrees with shell model calculations in ²⁰⁸ Pb(⁴⁰ Ar, Xγ) (2011Sz02).
1636 2	(3/2-)	C		E(level),Jπ: Level seen in (d,p) was only weakly excited and the angular distribution data was only qualitatively reproduced by the DWBA calculations (1975Se13).
1867.99 14	1/2+	A CD G	≤46 ps	T _{1/2} : From advanced time delayed βγγ(t) method in ⁴¹ Cl β- decay (2007Wh01).
1988 3		C		
2321 10		C		
2397.9 4	1/2-§	BCD G	0.12 ps 3	T _{1/2} : From τ=0.17 ps 5 (1978Ra13).
2568 1		C		
2701 3	1/2-, 3/2-	C		E(level): Tentative 2694 level in (n,γ) may correspond to this level.
2733.1 6	3/2-§	BCD	<31 fs	T _{1/2} : From τ<0.045 ps (1978Ra13).
2891 1	(9/2)+	C		E(level): Tentative 2889 level in ⁴¹ Cl β- may correspond to this level.
2948.5 8	3/2-§	BCD	<62 fs	T _{1/2} : From τ<0.09 ps (1978Ra13).
3009.8 10	3/2-	BCD	<111 fs	T _{1/2} : From τ<0.16 ps (1978Ra13).
3122 10		C		E(level): Tentative 3111 level in (n,γ) with a 3111γ may correspond to this level.
3293 5	1/2-, 3/2-	C		E(level): Tentative 3279 level in (n,γ) decaying by a 3111γ may correspond to this level. There is also a tentative 3293 level in ⁴¹ Cl β-.
3326.3 5	1/2-§	BCD	<17 fs	T _{1/2} : From τ<0.025 ps (1978Ra13).
3388 1	(1/2)-	C		
3433 1	1/2-	C		E(level): Tentative 3431 level in (n,γ) may correspond to this level.
3485 10		C		
3565 1		C		E(level): Tentative 3565 level in (n,γ) decaying by a 3565γ may correspond to this level.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{41}Ar Levels (continued)

E(level) [#]	$J\pi^{\ddagger}$	XREF	$T_{1/2}^{\dagger}$	Comments
3590 1	3/2-	C		E(level): Tentative 3573 level in (n, γ) decaying by a 3405 γ may correspond to this level.
3698 1		C		E(level): Tentative 3703 level in (n, γ) decaying by a 2668 γ may correspond to this level.
3734 10		C		E(level): Tentative 3732 level in (n, γ) decaying by a 3565 γ may correspond to this level.
3775 10		C		
3799 1	(1/2)-	C		
3847 5		C		
3900 5		C		
3968.1 7	1/2-	BCD	21 fs 12	$T_{1/2}$: From $\tau=0.030$ ps 17 (1978Ra13).
4108 6		C		
4123 1	3/2-	C		
4154 1	3/2-	C		
4251 10		C		
4270.0 15	3/2-	BC		
4295 1	1/2-, 3/2-	C		
4370 10		C		
4395 6		C		
4404 1	3/2-	C		
4447 6	1/2+	C		
4473 1	(1/2-, 3/2+)	C		
4513 1	(1/2)-	C		
4573 1	5/2+	C		
4613 7	1/2+	C		$J\pi$: L(d,p)=0.
4644 10		C		
4670 1	5/2+	C		
4683 10	(5/2-)	C		
4722 10		C		
4754 10		C		
4816 8		C		
4831 1	(5/2-, 9/2+)	C		
4900 10		C		
4935 1	1/2-	C		
4970 1	(5/2-, 9/2+)	C		
5016 1	1/2-, 3/2-	C		
5066 1	5/2-	C		
5115 10		C		
5134 10		C		
5153 1	(9/2)+	C		
5219 10		C		
5244 10		C		
5280 10		C		
5296 1		C		
5321 1	(5/2)-	C		
5406 1	3/2-, 7/2-	C		
5438 1	5/2-	C		
5486 1	7/2-	C		
5529 10		C		
5573 10		C		
5618 1	(5/2)-	C		
5675 10		C		
5711 1	(5/2-)	C		
5753 1	(7/2-, 9/2+)	C		
5789 1	5/2-	C		
5821 1	5/2-, 7/2-	C		
5870 10		C		
5920 1	(7/2)-	C		
5947 1		C		
5986 1	(5/2)-	C		
6036 1	5/2-	C		
6088 10		C		
6132 1	5/2-	C		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{41}Ar Levels (continued)

E(level) [#]	$J\pi^{\ddagger}$	XREF	E(level) [#]	XREF	E(level) [#]	XREF
6197 1	5/2-	C	6846 10	C	7682 10	C
6280 1	5/2-	C	6903 10	C	7725 10	C
6310 1	5/2-	C	6959 10	C	7761 10	C
6345 1	(5/2)-	C	7009 10	C	7818 10	C
6375 10		C	7049 10	C	7872 10	C
6419 10		C	7106 10	C	7945 10	C
6453 10		C	7170 10	C	7998 10	C
6475 1	5/2-	C	7220 10	C	8030 10	C
6512 1	5/2-	C	7282 10	C	8103 10	C
6564 1	(5/2-, 7/2-)	C	7311 10	C	8153 10	C
6614 1	(9/2+)	C	7351 10	C	8234 10	C
6672 10		C	7426 10	C	8277 10	C
6726 10		C	7480 10	C	8301 10	C
6762 10		C	7524 10	C		
6797 10		C	7595 10	C		

[†] From (d,p γ), unless otherwise stated.

[‡] Except where noted, assignments are from L-transfer and Ay(0) in (pol d,p) with $J\pi=1/2-$ when L=1, $J\pi=3/2-$ when L=1, $J\pi=5/2-$ when L=3, $J\pi=7/2-$ when L=3, $J\pi=1/2+$ when L=0, $J\pi=3/2+$ when L=2, $J\pi=5/2+$ when L=2, $J\pi=7/2+$ when L=4, and $J\pi=9/2+$ when L=4.

[§] From circular polarization measurements in (pol n, γ) (1972St04).

[#] From least-squares fit to E γ 's for levels populated in γ -ray studies. Others are primarily from (d,p). For neutron-unbound levels, see $^{40}\text{Ar}(\text{n,n})$: resonances dataset.

 $\gamma(^{41}\text{Ar})$

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\ddagger}$	Mult.	α	Comments
167.11	167.1 1	100	[M1]	0.00251	Mult.: From RUL, E2 component is negligible since pure E2 transition with B(E2) in the order 1600 W.u. exceeds the reasonable limit for ^{41}Ar . B(M1)(W.u.)=0.0149 8.
515.77	348.7 2	28 4			
	516.0 3	100 4	[E2]	4.49×10^{-4}	B(E2)(W.u.)=5.5 18.
1033.94	517.9 3	79 9	[E1]	1.29×10^{-4}	B(E1)(W.u.)=0.00036 +54-31.
	866.7 2	100 9	[E1]		B(E1)(W.u.)=0.00010 +14-8.
1353.71	837.5 3	20 3			
	1186.6 1	100 3			
	1353.6 2	4 3			
1504.8	1504.8 6	100			
1629.7	1629.7 3	100			
1867.99	514.2 1	100 11	[E1]	1.31×10^{-4}	B(E1)(W.u.) $>4.2 \times 10^{-5}$.
	833.8 2	54 11			
	1353.3 3	60 11	[E1]	1.77×10^{-4}	B(E1)(W.u.) $>1.4 \times 10^{-6}$.
2397.9	1044.3 4	100 7			
	1881.5 10	47 7			I γ : other: 23 in (n, γ).
	2229.5 20	7 3	[E2]		B(E2)(W.u.)=0.46 24.
2733.1	864	<5.4			
	1380	9 5			
	2566.1 8	100 5			
2948.5	1593 [#]	<8			
	2432.5 8	58			I γ : average of (n, γ) and (d,p γ).
	2781.8 15	100			
3009.8	2842.6 10	100			
3326.3	1458	8.5 24			E γ : from (d,p γ) only.
	1972.7 12	13.0 24			
	2291.7 20	3.4			E γ , I γ : from (n, γ) only.
	2810.6 8	100.0 24			
	3159	<9			E γ : from (d,p γ) only.
3968.1	2614.4 8	100			
	3451.8 10	69			I γ : from (n, γ).
4270.0	4102.7 15	100			

Footnotes continued on next page

Adopted Levels, Gammas (continued) $\gamma(^{41}\text{Ar})$ (continued)

† From β decay and (n, γ) when uncertainty is quoted, others are from level–energy differences, rounded off to nearest keV.

‡ From (d,p γ), unless otherwise stated.

Placement of transition in the level scheme is uncertain.

 ^{41}Cl β^- Decay (38.4 s) 2007Wh01,1974Gu10,1981HuZT

Parent ^{41}Cl : E=0; $J\pi=(1/2^+)$; $T_{1/2}=38.4$ s 8; Q(g.s.)=5760 70; % β^- decay=100.

2007Wh01: ^{41}Cl nuclei produced in the reaction U(p,X) at ISOLDE, with a proton beam energy of 1.4 GeV, that was then mass separated. Measured β decay products using a plastic scintillator. $E\gamma$, $I\gamma$, $\beta\gamma(t)$ were measured using fast timing detectors consisting of two BaF₂ crystals and LaBr₃(Ce) crystal, and two Ge detectors. Advanced Time Delayed $\beta\gamma(t)$ method was used to determine half–lives of excited states.

1981HuZT: ^{41}Cl produced from fragmentation of Uranium target with 600 MeV protons at ISOLDE followed by mass separation. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ –coin., $\gamma\beta$ –coin., γ – γ –t using Ge(Li) detectors and 4 π plastic beta counter. A scintillation telescope was used to measure β energy distributions. $E\gamma$ and $I\gamma$ data are not enumerated. The level scheme figure shows level–energies, β feedings and transition placements.

1974Gu10: ^{41}Cl produced in the three nucleon transfer reaction $^{181}\text{Ta}(^{40}\text{Ar}, ^{41}\text{Cl})$ at EMSONHIB at JINR. Measured $E\gamma$, $E\beta$, β – γ coin, $\gamma\gamma$ –coin, $T_{1/2}$ using a β plastic scintillator, a NaI(Tl) γ spectrometry, and a Ge(Li) detector. Five excited states reported up to 1869 keV. Determined maximum β energy and Q_β .

Others (^{41}Cl $T_{1/2}$ and isotopic identification): 1971ArZD, 1991Zh24, 1998WiZV.

 ^{41}Ar Levels

E(level) [†] #	$J\pi$ [‡]	$T_{1/2}$ [§]	Comments
0.0	7/2–		
167.10 9	5/2–	315 ps 15	
516.02 15	3/2–	0.26 ns 8	
1033.89 16	3/2+		
1353.63 11	3/2–	0.40 ps 6	$T_{1/2}$: from Adopted Levels.
1567?			
1867.77 14	1/2+	≤46 ps	
2035? 10			
2363?			
2842?			
2889?@	(9/2)+		
3237?			
3293?@			
3922?			
4084?			
4148?@			
4359?@			
4439?@			
4553?			
4683?@			

† From least–squares fit to $E\gamma$'s for levels ≤ 1868 keV.

‡ From Adopted Levels. $J\pi$'s proposed by 1981HuZT are not given here due to tentative nature of the level scheme.

§ From advanced time delayed $\beta\gamma(t)$ method in 2007Wh01, except where noted.

With the exception of 167, 516, 1035, 1354, and 1869 levels which have been reported by 2007Wh01 and 1974Gu10, all other levels proposed by 1981HuZT only are considered by the evaluators as tentative, since none of these are observed in (n, γ) and (d,p γ). A few of these levels are close in energy to those seen in (d,p).

@ This level may correspond to a nearby level in (d,p).

^{41}Cl β^- Decay (38.4 s) 2007Wh01,1974Gu10,1981HuZT (continued) β^- radiations

$\beta\gamma$ coincidence are shown in Kurie plot in 1974Gu10, indicating there are no β transitions to g.s and excited states up to 1110 keV. However 1981HuZT has indicated beta intensity to the excited levels, evaluators have considered these beta feedings as questionable and have given the values of 1981HuZT in comments.

$E\beta^-$	E(level)	$I\beta^-$	Log <i>ft</i>	Comments
(1080 † 70)	4683?			$I\beta^-$: 0.2 (1981HuZT).
(1210 † 70)	4553?			$I\beta^-$: 0.3 (1981HuZT).
(1320 † 70)	4439?			$I\beta^-$: 0.3 (1981HuZT).
(1400 † 70)	4359?			$I\beta^-$: 1 (1981HuZT).
(1610 † 70)	4148?			$I\beta^-$: 0.7 (1981HuZT).
(1680 † 70)	4084?			$I\beta^-$: 0.3 (1981HuZT).
(1840 † 70)	3922?			$I\beta^-$: 13 (1981HuZT).
(2470 † 70)	3293?			$I\beta^-$: 11 (1981HuZT).
(2520 † 70)	3237?			$I\beta^-$: 0.4 (1981HuZT).
(2870 † 70)	2889?			$I\beta^-$: 2.4 (1981HuZT).
(2920 † 70)	2842?			$I\beta^-$: 0.6 (1981HuZT).
(3400 † 70)	2363?			$I\beta^-$: 2.6 (1981HuZT).
(3730 † 70)	2035?			$I\beta^-$: 3 (1981HuZT).
(3890 70)	1867.77	90 10	5.01 6	$I\beta^-$: from evaluators with reference to the value >80% given in 1974Gu10. 63 (1981HuZT).
				$E\beta^-$: Other: 3800 150 from $\beta\gamma$ (1974Gu10).
(4190 † 70)	1567?			$I\beta^-$: <0.4 (1981HuZT).
(4410 † 70)	1353.63			$I\beta^-$: <18 (1981HuZT).
(4730 † 70)	1033.89			$I\beta^-$: <8 (1981HuZT).
(5240 † 70)	516.02			$I\beta^-$: <4 (1981HuZT).
(5590 † 70)	167.10			$I\beta^-$: <8 (1981HuZT).

† Existence of this branch is questionable.

 $\gamma(^{41}\text{Ar})$

$\gamma\gamma$ coincidence information is from 1974Gu10. Other coincidence was also observed between γ transitions with energy 514.2 keV and 167.1 keV that were gated on 1186.6 keV γ peak in 2007Wh01.

E(level)	$E\gamma^\dagger$	Mult. ^b	α	Comments
167.10	167.1@ 1	[M1]	0.00251	Mult.: E2 component is negligible since pure E2 transition with B(E2) in the order 1600 W.u. exceeds the reasonable limit for ^{41}Ar (2007Wh01).
516.02	348.7@ 2			Mult.: Admixture of M1 and E2 cannot be ruled out with pure B(E2) about 11 W.u.
	516.0 $\&$ 3	[E2]	4.49×10^{-4}	$E\gamma$: Observed as a multiplet at 514.2, 516.0 and 517.9 keV in 2007Wh01.
1033.89	517.9 $\&$ 3	[E1]	1.29×10^{-4}	
	866.7@ 2	[E1]		
	1034 $\frac{1}{2}$ #ad			
1353.63	837.5@ 3	[M1]		Mult.: E2 component is negligible since pure E2 transition with B(E2) in the order 66 W.u. exceeds the reasonable limit for ^{41}Ar (2007Wh01).
	1186.6@ 1	[M1]		Mult.: E2 component is negligible since pure E2 transition with B(E2) in the order 58 W.u. exceeds the reasonable limit for ^{41}Ar (2007Wh01).
	1353.6 $\&$ 2	[E2]		$E\gamma$: Observed as a doublet at 1351.3 and 1353.6 keV in 2007Wh01.
1567?	533 ^a			
	1400 ^a			
	1567 ^a			
1867.77	514.2@ 1	[E1]	1.31×10^{-4}	
	833.8@ 2			
	1351.3@ 3	[E1]	1.76×10^{-4}	
	1701 $\frac{1}{2}$ #ad			
2035?	681 ^d			
	1001 ^d			
	1519 ^d			
	1868 ^d			
2363?	796 ^d			
	1329 ^d			
	1847 ^d			
	2196 ^d			
2842?	1275 ^d			
	2842 ^d			

Continued on next page (footnotes at end of table)

^{41}Cl β^- Decay (38.4 s) 2007Wh01,1974Gu10,1981HuZT (continued) $\gamma(^{41}\text{Ar})$ (continued)

E(level)	$E\gamma^\dagger$	E(level)	$E\gamma^\dagger$	E(level)	$E\gamma^\dagger$
2889?	1322 ^d	3922?	2054 ^d	4359?	2792 ^d
	1535 ^d		2355 ^d		3325 ^d
	1855 ^d		2568 ^d		3843 ^d
	2373 ^d		3406 ^d		4192 ^d
	2889 ^d		3755 ^d		4359 ^d
3237?	2203 ^d		3922 ^d	4439?	3085 ^d
	3237 ^d	4084?	3568 ^d		4439 ^d
3293?	930 ^d		4084 ^d	4553?	1664 ^d
	1425 ^d	4148?	3114 ^d		4553 ^d
	1726 ^d		3632 ^d	4683?	3329 ^d
	2777 ^d		3981 ^d		4167 ^d
	3293 ^d		4148		4683 ^d
3922?	1033 ^d	4359?	1517 ^d		
	1559 ^d		2324 ^d		

[†] From level-energy differences for levels >1868 keV.

[‡] Not reported in 1974Gu10.

[§] γ not reported by 1981HuZT.

Transition is suspect since implied mult=M2.

@ From 2007Wh01.

& From Adopted Gammas.

^a Not reported in 2007Wh01.

^b From Adopted Levels.

^d Placement of transition in the level scheme is uncertain.

Decay Scheme

$^{41}\text{Cl} \beta^-$ Decay (38.4 s) 2007Wh01,1974Gu10,1981HuZT (continued)

Decay Scheme (continued)

 $^{40}\text{Ar}(n,\gamma),(\text{pol } n,\gamma) \text{ E=thermal}$ 1970Ha56,1972St04,1967Ly05

- 1972St04: (pol n,γ). Circular polarization measured for states up to 3.4 MeV. Determined $J\pi$.
- 1970Ha56 (also 1967Ar14): Neutrons produced from heavy water reactor at Stockholm. Measured E_γ , I_γ for secondary and primary transitions using a Ge(Li) detector.
- 1968Sk02: Neutrons produced from heavy water reactor at Stockholm. Measured E_γ from thermal neutron capture of natural argon target with Ge(Li) detector and an anticoincidence spectrometers.
- 1967Ly05: (n,γ). Measured 25 transitions; E_γ , I_γ , $\gamma\gamma$ using Ge(Li) detectors.
- 1962Ba22: Pair-spectrometer measurements at Chalk River Laboratories. Measured, two γ energies and their intensities and $\gamma\gamma$ -coin. using NaI detectors.

 ^{41}Ar Levels

E(level) [§]	$J\pi^\dagger$	Comments
0.0	$7/2^-$	
167.3 17	$5/2^-$	
516.1 21	$3/2^- \frac{1}{2}$	
1034.7 6	$3/2^+$	
1353.9 22	$3/2^- \frac{1}{2}$	
2398.1 4	$1/2^- \frac{1}{2}$	
2693? 3		
2733.4 7	$3/2^- \frac{1}{2}$	
2948.7 7	$3/2^- \frac{1}{2}$	
3009.6 8	$3/2^-$	
3111.4? 22		
3278.7? 22		
3326.8 6	$1/2^- \frac{1}{2}$	
3430.7? 21		
3564.9? 25		
3573? 3		
3702.9? 21		
3732? 3		

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{n},\gamma),(\text{pol n},\gamma)$ E=thermal 1970Ha56,1972St04,1967Ly05 (continued) **^{41}Ar Levels (continued)**

E(level) [§]	J π [†]	Comments
3968.2 6	1/2-	
4270.0 10	3/2-	
(6098.9 4)	1/2+	E(level): 6098.9 3 from 2012Wa38. J π : s-wave capture in ^{40}Ar g.s.

[†] From Adopted Levels, unless otherwise stated.[‡] From circular polarization measurement for primary γ (1972St04).[§] From least-squares fit to E γ 's. **$\gamma(^{41}\text{Ar})$**

Polarization functions (ratio R) for circular polarization are from 1972St04.

I γ normalization: Normalized assuming $\Sigma I\gamma(\text{g.s.})=100$.

E γ [†]	E(level)	I γ [‡]	Comments
167.3 2	167.3	79.6	
348.7 3	516.1	6.6	
516.0 3	516.1	25.3	
837.7 3	1353.9	9.6	
867.3 6	1034.7	1.1	
1044.3 4	2398.1	6.0	
1186.8 3	1353.9	52.2	
1354.0 4	1353.9	2.3	
1828.8 12	(6098.9)	1.0	
1881.5 10	2398.1	1.4	
1972.6 12	3326.8	0.54	
2130.7 8	(6098.9)	4.4	
2229.5 20	2398.1	0.29	
2291.6 20	3326.8	0.20	
2432.5 8	2948.7	0.84	
2566.1 8	2733.4	2.8	
2614.3 8	3968.2	2.9	
2668.1 [§] 20	3702.9?	0.51 [§]	
	(6098.9)	0.51 [§]	
2771.8 8	(6098.9)	8.6	R=+0.45 18. 2772 γ is unresolved from 2782 γ (from 2948 level) in 1972St04.
2781.8 15	2948.7	1.7	
2810.5 8	3326.8	5.9	
2842.5 10	3009.6	0.88	
3089.4 10	(6098.9)	1.1	
3111.3 [§] 22	3111.4?	0.40 [§]	
	3278.7?	0.40 [§]	
3150.2 10	(6098.9)	4.0	R=-0.4 4.
3365.5 10	(6098.9)	4.2	R=-0.8 4.
3405.3 [§] 25	(6098.9)	0.08 [§]	
3405.5 [§] 25	3573?	0.08 [§]	
3451.8 10	3968.2	2.0	
3564.5 [§] 25	3732?	0.13 [§]	
3564.7 [§] 25	3564.9?	0.13 [§]	
^x 3658.5 18		0.25	
3700.4 8	(6098.9)	9.8	R=+1.27 17.
4102.5 15	4270.0	0.3	
4745.0 8	(6098.9)	55.0	R=-0.46 2.
^x 4916.8 20		0.07	
5063.7 10	(6098.9)	0.26	
^x 5448.6 25		0.05	
5582.0 8	(6098.9)	11.6	R=-0.44 6.
^x 5960.2 25		0.01	
^x 6062.6 25		0.04	
^x 6082.3 25		0.02	
^x 6092.8 25		0.03	
^x 6142.0 25		0.02	

Footnotes continued on next page

⁴⁰Ar(n,γ),(pol n,γ) E=thermal 1970Ha56,1972St04,1967Ly05 (continued)

γ(⁴¹Ar) (continued)

† From 1970Ha56. Values given by 1967Ly05 agree with those from 1970Ha56, but are less precise. E_γ reported by 1970Ha56 and 1967Ly05 were recoil corrected. Recoil energies have been subtracted by evaluators.

‡ For intensity per 100 neutron captures, multiply by 0.93.

§ Multiply placed; undivided intensity given.

* γ ray not placed in level scheme.

Level Scheme

Intensities: ; per 100 n-captures
& Multiply placed; undivided intensity given

⁴⁰Ar(n,γ) E=res 1974Ke18

1974Ke18: E_n=15-70 keV and 58 keV produced from ⁷Li(p,n)⁷Be reaction. Measured E_γ, I_γ using Ge(Li).

⁴¹Ar Levels

E(level)	Jπ [†]	Comments
0.0	7/2-	
167	5/2-	
516	3/2-	
1035	3/2+	
1354	3/2-	
(S(n)+y)		E(level): S(n)+y: S(n)=6098.9 3 (2012Wa38). y=E(n)(c.m.)=0.98 E(n)(lab) where E(n)(lab)=x= 15-70 keV.
(6156 4)		E(level): S(n)+E(n)(c.m.). S(n)=6098.9 3 (2012Wa38). E(n)(c.m.) is deduced from E(n)(lab) where E(n)(lab)=58 keV 4. The 58-keV resonance is probably at 59.309 reported by 1991Wi02 in ⁴⁰ Ar(n,n). Jπ: (5/2+) suggested by 1974Ke18, but a 59.309 resonance (1991Wi02) is assigned as 1/2-.

† From Adopted Levels.

$^{40}\text{Ar}(\text{n},\gamma)$ E=res 1974Ke18 (continued) $\gamma(^{41}\text{Ar})$

E_γ	E(level)	$I_\gamma^\dagger$	Comments
838	1354	5 1	
1187	1354	33 3	
4744+x [†]	(S(n)+y)	71 3	E_γ : feeds 1354 level.
4802	(6156)	34 3	E_γ : 4744 + 58 keV. E_γ : feeds 1354 level.
5063+x [†]	(S(n)+y)	10 2	E_γ : feeds 1035 level.
5121	(6156)	26 3	E_γ : 5063 + 58 keV. E_γ : feeds 1035 level.
5582+x [†]	(S(n)+y)	1.0 10	E_γ : feeds 516 level.
5933+x [†]	(S(n)+y)	2.5 10	E_γ : feeds 167 level.
6098+x [†]	(S(n)+y)	15 2	E_γ : feeds g.s.
6156	(6156)	40 4	E_γ : 6098 + 58 keV. E_γ : feeds g.s. If $J\pi$ of the 58-keV resonance is 1/2-, then this transition involving $\Delta J=3$ would be suspect.

[†] x=17-30 keV.[‡] Absolute intensity per 100 neutron captures.

Level Scheme

Intensities: I_γ per 100
neutron captures **$^{40}\text{Ar}(\text{n},\text{n}):$ Resonances 1991Wi02**

- 1991Wi02: $E_n = 7$ keV to 50 MeV produced from the Oak Ridge Electron Linear Accelerator (ORELA). Neutrons detected with the NE110 scintillator. 206 resonances reported from 11.18 to 1517.95 keV (6109.8-7579.8 excitation energy in ^{41}Ar) with resonance parameters. Cross section data fitted with R-matrix analysis. Determined resonance widths and deduced $J\pi$ assignments.
- 1975Li01: $E_n=1-580$ keV from pulsed neutron at the Columbia University Nevis synchrocyclotron. Neutron detected with NaI detectors. 24 resonances reported from 11.17 to 569.3 keV. Resonance parameters determined using R-matrix analysis.
- 1968SeZX: $E_n = 30-650$ keV produced from $^7\text{Li}(\text{p},\text{n})^7\text{Be}$ reaction at the Van de Graaff accelerator at Duke University. Measured total neutron cross sections. 13 resonance fitted with R-matrix analysis were reported. Determined resonance width.
- 1953Gu13: $E_n=450-1100$ keV from $^7\text{Li}(\text{p},\text{n})^7\text{Be}$ reaction at the Rockefeller electrostatic generator. Neutrons detected with a pressurized hydrogen recoil counter.
- 1949Me51: $E<10$ keV. No resonances were found.

 ^{41}Ar Levels

All data are from 1991Wi02.

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{n},\text{n}): \text{Resonances}$ $1991\text{Wi02 (continued)}$ ^{41}Ar Levels (continued)

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$g\Gamma_n$ (eV)	Comments
6109.8 3		0.18 1	E(n)lab=11.181 5.
6116.4 3		0.46 2	E(n)lab=17.974 8.
6156.8 3	1/2-	6.36 12	E(n)lab=59.31 3.
6158.3 3		0.69 4	E(n)lab= 60.92 3.
6173.5 3	1/2+	5672 3	E(n)lab= 76.49 4.
6186.8 3		3.98 16	E(n)lab=90.06 5.
6188.7 3		1.0 1	E(n)lab= 92.08 5.
6189.9 3		2.0 1	E(n)lab=93.28 5.
6193.1 3		5.4 2	E(n)lab=96.54 5.
6198.4 3		27.9 6	E(n)lab=101.99 5.
6202.0 3		1.1 1	E(n)lab=105.69 6.
6212.1 3	1/2-	435 1	E(n)lab=116.05 6.
6245.1 3	3/2-	12.0 4	E(n)lab=149.89 8.
6267.0 3	1/2+	5550 6	E(n)lab=172.27 10.
6275.5 3	3/2-	205 2	E(n)lab=180.97 11.
6279.9 3		24.3 8	E(n)lab=185.57 11.
6287.5 3	3/2-	106 1	E(n)lab=193.32 12.
6289.5 3		5.8 4	E(n)lab=195.41 12.
6290.8 3		7.1 4	E(n)lab=196.69 12.
6292.6 3		9.8 5	E(n)lab=198.55 12.
6313.7 3	1/2+	1920 4	E(n)lab=220.13 14.
6321.0 3		3.4 3	E(n)lab=227.63 14.
6336.2 3	3/2+	74 1	E(n)lab=243.20 16.
6339.4 3		9.0 5	E(n)lab=246.49 16.
6347.8 3	1/2+	3785 6	E(n)lab=255.08 17.
6348.1 3		26.0 16	E(n)lab=255.43 17.
6350.7 3	3/2-	158.4 25	E(n)lab=258.13 17.
6361.1 3	1/2+	398 2	E(n)lab=268.72 18.
6367.9 3	3/2+	332 2	E(n)lab=275.76 18.
6379.3 4		29 2	E(n)lab=287.45 19.
6389.5 4	3/2-	368 2	E(n)lab=297.87 20.
6393.8 4		142 2	E(n)lab=302.31 21.
6394.2 4		13 1	E(n)lab=302.71 21.
6405.4 4	3/2+	157 2	E(n)lab=314.18 22.
6414.1 4		52 2	E(n)lab=323.11 22.
6432.2 4	3/2-	770 3	E(n)lab=341.63 24.
6434.4 4		9 1	E(n)lab=343.86 24.
6450.0 4		50 2	E(n)lab=359.9 3.
6454.2 4	3/2+	216 2	E(n)lab=364.2 3.
6460.3 4		85 2	E(n)lab=370.4 3.
6462.3 4	1/2-	620 3	E(n)lab= 372.5 3.
6464.4 4	3/2-	137 2	E(n)lab=374.6 3.
6476.8 4		50 2	E(n)lab=387.4 3.
6477.3 4		10 1	E(n)lab=387.8 3.
6480.7 4	1/2+	1290 5	E(n)lab=391.4 3.
6485.9 4		12 2	E(n)lab=396.7 3.
6492.8 4	3/2-	537 3	E(n)lab=403.8 3.
6498.3 4	1/2+	36 2	E(n)lab=409.4 3.
6507.8 4		94 3	E(n)lab=419.2 3.
6515.4 4		182 3	E(n)lab=426.9 3.
6522.4 4		40 2	E(n)lab=434.1 3.
6523.8 4		26 2	E(n)lab=435.6 3.
6533.8 5	1/2+	67 2	E(n)lab=445.8 3.
6545.3 5	3/2-	880 4	E(n)lab=457.5 4.
6552.0 5		87 3	E(n)lab=464.5 4.
6558.9 5	3/2-	2270 7	E(n)lab=471.6 4.
6603.4 5	1/2+	144 3	E(n)lab=517.1 4.
6604.4 5		77 3	E(n)lab=518.1 4.
6619.7 5	5/2-	1114 5	E(n)lab=533.8 4.
6624.4 5		15 2	E(n)lab=538.6 4.
6639.4 5	3/2-	507 4	E(n)lab=554.0 5.
6646.8 6		63 3	E(n)lab=561.6 5.
6656.1 6	3/2-	4856 1	E(n)lab=571.2 5.

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$^{40}\text{Ar}(n,n)$: Resonances 1991Wi02 (continued) **^{41}Ar Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$g\Gamma_n$ (eV)	Comments
6661.3 6		30 3	E(n)lab= 576.5 5.
6666.0 6		20 2	E(n)lab=581.3 5.
6678.0 6	1/2-	1272 9	E(n)lab=593.5 5.
6681.0 6	1/2+	4973 2	E(n)lab=596.6 5.
6690.5 6	3/2-	662 5	E(n)lab=606.4 5.
6691.8 6		59 4	E(n)lab=607.8 5.
6708.2 6	3/2+	475 5	E(n)lab=624.5 5.
6713.8 6	1/2-	1255 1	E(n)lab=630.3 6.
6714.6 6	5/2-	1820 1	E(n)lab=631.1 6.
6741.4 6	3/2-	968 7	E(n)lab=658.6 6.
6746.4 7	5/2+	1765 1	E(n)lab= 663.7 6.
6747.3 7	3/2	683 1	E(n)lab=664.6 6.
6748.0 7	1/2+	273 6	E(n)lab=665.3 6.
6753.1 7	3/2-	400 5	E(n)lab=670.5 6.
6764.4 7	3/2+	271 4	E(n)lab= 682.1 6.
6767.6 7		43 1	E(n)lab=685.4 6.
6782.6 7	5/2-	1704 8	E(n)lab=700.7 6.
6786.9 7	3/2-	497 5	E(n)lab=705.2 6.
6792.0 7		107 5	E(n)lab=710.5 7.
6798.0 7	1/2-	2052 2	E(n)lab=716.6 7.
6799.5 7	3/2-	4881 2	E(n)lab=718.1 7.
6811.6 7		29 3	E(n)lab= 730.5 7.
6825.2 7		20 2	E(n)lab=744.5 7.
6834.9 8	5/2-	481 43	E(n)lab=754.4 7.
6835.0 8	3/2-	422 13	E(n)lab=754.5 7.
6838.0 8		86 5	E(n)lab=757.6 7.
6841.3 8	1/2-	366 6	E(n)lab=761.0 7.
6853.9 8	1/2+	1674 18	E(n)lab=773.8 7.
6855.8 8		100 6	E(n)lab=775.9 7.
6861.3 8	3/2+	380 6	E(n)lab=781.4 7.
6863.1 8	3/2-	380 6	E(n)lab=783.3 7.
6865.1 8	1/2+	46 4	E(n)lab=785.4 8.
6867.0 8	1/2-	157 6	E(n)lab=787.3 8.
6889.2 8		121 6	E(n)lab=810.0 8.
6893.3 8	3/2-	802 13	E(n)lab=814.3 8.
6895.7 8	1/2-	4162 26	E(n)lab= 816.7 8.
6896.1 8	5/2-	789 9	E(n)lab=817.1 8.
6907.8 8		378 8	E(n)lab=829.2 8.
6909.2 8	3/2-	321 6	E(n)lab=830.5 8.
6917.1 9		46 4	E(n)lab=838.7 8.
6922.3 9		138 6	E(n)lab=844.0 8.
6934.6 9		210 8	E(n)lab=856.6 9.
6935.3 9	1/2+	6132 46	E(n)lab=857.3 9.
6939.1 9	3/2-	616 11	E(n)lab=861.2 9.
6948.7 9		86 3	E(n)lab=871.1 9.
6950.0 9		278 8	E(n)lab=872.3 9.
6951.7 9	3/2-	2861 19	E(n)lab=874.1 9.
6952.2 9	3/2+	272 12	E(n)lab=874.6 9.
6955.2 9	1/2-	489 10	E(n)lab=877.7 9.
6960.9 9	3/2+	755 9	E(n)lab=883.6 9.
6967.0 9	1/2-	98 6	E(n)lab=889.8 9.
6976.1 9	1/2+	48 5	E(n)lab=899.1 9.
6977.1 9	3/2-	2032 14	E(n)lab=900.2 9.
6984.4 9		159 8	E(n)lab=907.9 9.
6988.2 10	1/2-	1218 18	E(n)lab=911.5 9.
6989.0 10	3/2+	179 9	E(n)lab=912.3 9.
6995.0 10	5/2-	27 3	E(n)lab=918.6 9.
6999.0 10	5/2+	500 9	E(n)lab=922.6 9.
7003.0 10	3/2+	144 7	E(n)lab=926.7 10.
7005.9 10	3/2-	169 7	E(n)lab=929.7 10.
7014.1 10	5/2+	2778 14	E(n)lab=938.0 10.
7026.5 10	1/2-	217 13	E(n)lab=950.8 10.
7027.3 10		555 16	E(n)lab=951.6 10.

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(n,n)$: Resonances 1991Wi02 (continued) **^{41}Ar Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$g\Gamma_n$ (eV)	Comments
7038.3 10	5/2+	1394 40	E(n)lab=962.9 10.
7039.2 10		812 38	E(n)lab=963.8 10.
7044.4 10		108 7	E(n)lab=969.1 10.
7058.3 11	1/2+	39270 120	E(n)lab=983.4 10.
7084.6 11		154 15	E(n)lab=1010.3 11.
7086.0 11	5/2+	533 13	E(n)lab=1011.8 11.
7090.8 11	1/2-	980 18	E(n)lab=1016.7 11.
7091.9 11	5/2+	1896 20	E(n)lab=1017.8 11.
7096.6 11	3/2-	758 13	E(n)lab=1022.7 11.
7100.0 11	3/2-	890 19	E(n)lab=1026.2 11.
7104.0 11	1/2-	288 13	E(n)lab=1030.3 11.
7105.9 11	5/2+	294 12	E(n)lab=1032.2 11.
7107.3 11	1/2+	21387 95	E(n)lab=1033.6 11.
7112.6 11	5/2+	782 16	E(n)lab=1039.1 11.
7116.5 11	1/2-	186 15	E(n)lab=1043.0 11.
7123.3 11	3/2-	1256 18	E(n)lab=1050.0 11.
7126.7 12	5/2+	1829 19	E(n)lab=1053.5 11.
7154.1 12	1/2+	1589 27	E(n)lab=1081.6 12.
7164.5 12	1/2+	243 14	E(n)lab=1092.2 12.
7168.0 12	5/2+	208 10	E(n)lab=1095.8 12.
7173.7 12	1/2+	2901 53	E(n)lab=1101.7 12.
7176.1 12	3/2-	688 22	E(n)lab=1104.1 12.
7193.1 13		78 7	E(n)lab=1121.6 12.
7196.6 13		237 12	E(n)lab=1125.2 12.
7199.9 13		358 12	E(n)lab=1128.5 13.
7204.4 13		47 4	E(n)lab=1133.1 13.
7204.5 13	1/2+	13370 140	E(n)lab=1133.2 13.
7216.0 13	1/2-	5434 77	E(n)lab=1145.0 13.
7222.0 13	5/2+	9568 54	E(n)lab=1151.2 13.
7229.9 13	3/2-	250 12	E(n)lab=1159.3 13.
7236.6 13	5/2+	6901 35	E(n)lab=1166.2 13.
7243.2 13		39 4	E(n)lab=1172.9 13.
7250.7 13	3/2-	342 13	E(n)lab=1180.6 13.
7253.6 13		76 7	E(n)lab=1183.6 13.
7256.2 14	1/2-	159 10	E(n)lab=1186.2 13.
7269.5 14	3/2+	1261 19	E(n)lab=1199.8 14.
7271.8 14		463 14	E(n)lab=1202.2 14.
7277.1 14	1/2+	1577 47	E(n)lab=1207.7 14.
7297.2 14	1/2-	4090 57	E(n)lab=1228.2 14.
7298.3 14		348 16	E(n)lab=1229.4 14.
7308.0 14	5/2-	5678 37	E(n)lab= 1239.3 14.
7311.8 14	1/2+	26580 230	E(n)lab= 1243.2 14.
7314.2 14		141 13	E(n)lab=1245.6 14.
7325.7 15	5/2+	500 21	E(n)lab=1257.5 15.
7333.9 15	5/2+	3504 34	E(n)lab=1265.8 15.
7340.7 15	1/2-	2090 49	E(n)lab=1272.8 15.
7344.5 15	5/2+	16777 80	E(n)lab=1276.7 15.
7356.2 15	3/2-	1321 22	E(n)lab=1288.8 15.
7362.6 15	3/2+	1068 22	E(n)lab=1295.3 15.
7374.3 15		150 15	E(n)lab= 1307.3 16.
7379.2 16	1/2+	25480 340	E(n)lab=1312.3 16.
7392.5 16	1/2+	15110 170	E(n)lab=1326.0 16.
7393.5 16	5/2+	7129 66	E(n)lab=1327.0 16.
7395.0 16		49 5	E(n)lab=1328.5 16.
7400.1 16		155 14	E(n)lab=1333.8 16.
7405.0 16	3/2-	1207 29	E(n)lab=1338.8 16.
7409.5 16	3/2-	1115 29	E(n)lab=1343.4 16.
7420.1 16	5/2+	5513 72	E(n)lab=1354.2 16.
7420.4 16	1/2+	39770 260	E(n)lab=1354.6 16.
7427.0 16	5/2+	37370 160	E(n)lab=1361.3 16.
7433.2 16	5/2+	2814 57	E(n)lab=1367.6 17.
7441.9 17		395 23	E(n)lab=1376.6 17.
7449.4 17		1410 29	E(n)lab=1384.3 17.

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{n},\text{n}): \text{Resonances}$ 1991Wi02 (continued) **^{41}Ar Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$g\Gamma_n$ (eV)	Comments
7463.7 17	5/2+	16237 76	$E(\text{n})_{\text{lab}}=1399.0$ 17.
7470.3 17		579 23	$E(\text{n})_{\text{lab}}=1405.7$ 17.
7481.5 17	3/2-	1419 48	$E(\text{n})_{\text{lab}}=1417.2$ 17.
7482.6 17	5/2+	1272 45	$E(\text{n})_{\text{lab}}=1418.3$ 17.
7487.1 17	5/2+	1842 33	$E(\text{n})_{\text{lab}}=1422.9$ 18.
7498.0 18	1/2+	53040 370	$E(\text{n})_{\text{lab}}=1434.0$ 18.
7504.7 18	5/2+	2639 59	$E(\text{n})_{\text{lab}}=1441.0$ 18.
7508.9 18	5/2+	18920 120	$E(\text{n})_{\text{lab}}=1445.2$ 18.
7521.7 18	5/2+	22040 120	$E(\text{n})_{\text{lab}}=1458.4$ 18.
7532.2 18	5/2+	3142 46	$E(\text{n})_{\text{lab}}=1469.1$ 18.
7541.3 18		660 25	$E(\text{n})_{\text{lab}}=1478.4$ 19.
7545.5 18		228 18	$E(\text{n})_{\text{lab}}=1482.8$ 19.
7557.1 19	1/2+	107900 800	$E(\text{n})_{\text{lab}}=1494.7$ 19.
7557.6 19		773 25	$E(\text{n})_{\text{lab}}=1495.1$ 19.
7569.5 19	5/2+	3720 320	$E(\text{n})_{\text{lab}}=1507.3$ 19.
7571.1 19		800 80	$E(\text{n})_{\text{lab}}=1509.0$ 19.
7579.8 19	5/2+	28900 970	$E(\text{n})_{\text{lab}}=1518.0$ 19.

† $S(\text{n})+E(\text{n})(\text{c.m.})$. $S(\text{n})=6098.9$ 3 (2012Wa38). $E(\text{n})(\text{c.m.})$ is deduced from $E(\text{n})_{\text{lab}}$ in 1991Wi02. $\Delta E(\text{n})_{\text{lab}}$ calculated by evaluators using equation 2.2 in 1991Wi02.

‡ From R-matrix analysis. 1/2+ from s-wave resonance; 1/2-, 3/2- from p-wave resonance and 3/2+, 5/2+ from d-wave resonance.

 $^{40}\text{Ar}(\text{d},\text{p}), (\text{pol d},\text{p}), ^2\text{H}(^{40}\text{Ar},\text{p})$ 1988EcZY, 1975Se13, 1961Ka18

Other main references: 1966Ho03, 1968Fi05.

2008Ga24: $^2\text{H}(^{40}\text{Ar},\text{p})$, inverse kinematics reaction. ^{40}Ar beam was accelerated to an energy of 11 MeV/nucleon at GANIL/SPIRAL on a CD_2 target. The outgoing protons were detected using an array consisting of 8 DSSDs (MUST) located 10 cm upstream from the target. Angular coverage was from 95° to 175° in the lab frame. The background was detected using the GANIL SPEG spectrometer. The detection system consists of two cathode readout drift chambers, an ionization chamber and plastic scintillator. Measured excitation energies of the states, angular distributions, and the differential cross sections. Deduced L-values and spectroscopic factors from DWBA analysis. FWHM=280 keV.

1988EcZY (also 1986EcZZ): (pol d,p). $E_d=20$ MeV. Proton spectra were measured with a 120 cm single wire detector at the focal plane of the Munich Q3D magnetic spectrograph. Measured $\sigma(\theta)$, vector analyzing powers. FWHM ≈ 15 keV estimated by evaluators. Excitation energies up to 6.5 MeV compared with DWBA calculations.

1975Se13: (pol d,p). $E_d=14.83$ MeV. Measured $\sigma(\theta)$, vector analyzing powers. Proton measured with surface barrier and Si(Li) detectors between $\theta=15^\circ$ – 130° lab angles. FWHM ≈ 15 keV estimated by evaluators. Excitation energies up to 6.57 MeV were determined.

1975Ca24 (also 1971Co15): (d,p) $E_d=1.5$ – 2.5 MeV at the HVEC Van de Graaff at CSFN in Catania. Outgoing particles detected with surface barrier detectors. Measured $\sigma(\theta)$ at 100° , 12° , 140° , and 160° , and deduced spectroscopic factors for a few states. FWHM ≈ 15 keV estimated by evaluators. Excitation energies up to 2.5 MeV compared with DWBA calculations.

1968Fi05: (d,p). $E_d=11.6$ MeV from Heidelberg cyclotron. Outgoing particles detected with surface barrier and Li(Si) detectors. Measured $\sigma(\theta)$, deduced L-values and S factors. Excitation energies up to 3.97 MeV compared with DWBA calculations.

1966Ho03: (d,p) $E_d=11$ MeV from Tandem Accelerator at University of Pennsylvania. Measured proton energies between 20° , 35° , and 50° . Reaction products were magnetically analyzed and focused onto nuclear emulsion. FWHM=30 keV estimated by evaluators. Excitation energies up to 8.3 MeV compared with DWBA calculations.

1961Ka18: (d,p). $E_d=7.5$ MeV from the MIT-ONR electrostatic accelerator. Protons were detected from nuclear emulsions. Measured $\sigma(\theta)$ at 40° – 130° with 5° intervals. DWBA calculations. Estimated FWHM=20 keV by evaluators. Excitation energies up to 6.15 MeV compared with PWBA calculations.

Others:

1967Wi05: (d,p). IAR anomalies in (d,p) excitation function. Excitation energies 2.5–3.1 MeV were measured.

1956Bu94: (d,p). $E_d=8.4$ MeV. Measured $\sigma(\theta)$ and deduced L values for 10 states up to 3.98 MeV.

1952Gi01: (d,p). $E_d=7.8$ MeV. Measured $\sigma(\theta)$ and deduced L values for g.s. and 1340 keV.

1949Da15: (d,p). Measured proton groups and cross sections for 10 states up to 3.84 MeV.

1949Sa19: (d,p). $E=3.90$ MeV from the Yale cyclotron. Measured Q value.

$^{40}\text{Ar}(\text{d,p}), (\text{pol d,p}), ^2\text{H}(^{40}\text{Ar,p})$ 1988EcZY, 1975Se13, 1961Ka18 (continued) ^{41}Ar Levels

Differential cross sections for $^{40}\text{Ar}(\text{d,p})$ reaction					
Level	$\text{d}\sigma/\text{d}\Omega$ (20°)	$\text{d}\sigma/\text{d}\Omega$ (max)	Level	$\text{d}\sigma/\text{d}\Omega$ (20°)	$\text{d}\sigma/\text{d}\Omega$ (max)
	1988EcZY	1961Ka18		1988EcZY	1961Ka18
0	4.155	2.6(40°)	4513	0.143	0.08
168	0.141	0.05	4573	0.483	1.0(16°)
516	0.971	4.7(16°)	4613		0.76(0°)
1034	0.514	0.53(34°)	4670	0.583	1.7(20°)
1354	4.481	24.4(17°)	4816		0.09
1636		0.04	4831	0.481	0.52(18°)
1870	0.261	5.0(0°)	4935	0.172	1.9(0°)
1988		0.02	4970	0.577	0.8
2398	0.509	5.3(18°)	5016	0.299	2.5(10°)
2568	0.044		5066	0.820	1.0(15°)
2701		0.67(17°)	5153	0.303	
2733	0.829	5.8(16°)	5296	0.055(27.5°)	
2891	0.086	0.57(0°)	5321	0.107	
2948	0.555	4.1(18°)	5406	0.252(25°)	2.0(8°)
3010	0.223	1.9(18°)	5438	0.401(17.5°)	0.95(10°)
3293		0.49(15°)	5486	0.264	
3326	1.744	11.1(15°)	5618	0.350(22.5°)	
3388	0.302	0.14(35°)	5711	0.197(17.5°)	
3433	0.181	1.0(15°)	5753	0.223	0.90(10°)
3565	0.083	0.14	5789	0.515	0.75(10°)
3590	0.102	0.15(30°)	5821	0.449	1.1
3698	0.167	0.10	5920	0.182	
3799	0.089(22.5°)	1.14(15°)	5947	0.158(25°)	
3847		0.04	5986	0.080(17.5°)	
3900		0.02	6036	0.788	0.7(20°)
3968	1.470	12.4(15°)	6132	1.257	1.2(15°)
4108		0.1	6197	0.836	
4123	0.278	0.2	6280	0.209	
4154	0.211	0.18	6310	0.276	
4273	0.246	2.4(13°)	6345	0.291	
4295	0.232	0.48(0°)	6475	0.769	
4395		1.18(0°)	6512	0.499	
4404	0.224	0.10	6564	0.178	
4447		0.50(0°)	6614	0.157	
4473	0.061	0.1			

E(level) [†]	$J\pi$ [†]	L [†]	(2J+1)S [@]	Comments
0.0	7/2-	3	2.82	(2J+1)S: Others: 2.96 48 (2008Ga24), 4.2 7 (1975Se13), 3.10 (1968Fi05), 3.8 (1975Ca24).
167 1	(5/2)-	3	0.31 5	$J\pi$: 7/2- proposed by 1975Se13 from vector analyzing power data, which was L=2 or 3 but was considered not well reproduced by the DWBA calculations as the state was only weakly populated. Evaluators assign (5/2-) since γ from 1/2- is seen in $^{40}\text{Ar}(\text{n},\gamma)$. (2J+1)S: From 1975Se13 for 5/2. Other: 0.12 (1988EcZY) for 5/2.
516 1	3/2-	1	0.28	(2J+1)S: Others: 0.32 8 (2008Ga24), 0.35 6 (1975Se13), 0.29 (1968Fi05), 0.68 (1975Ca24).
1034 1	3/2+	2	(0.30)	(2J+1)S: Others: 0.36 6 (1975Se13), 0.24 (1968Fi05), 0.16 (1975Ca24).
1354 1	3/2-	1	1.40	(2J+1)S: Others: 1.92 36 (2008Ga24), 1.7 3 (1975Se13), 1.46 (1968Fi05), 1.8 (1975Ca24).
1636 [§] 2	3/2-		0.092 32	(2J+1)S: From 1975Se13 for L=1. $J\pi$: Level seen in 1975Se13 was only weakly excited and the angular distribution data was only qualitatively reproduced by the DWBA calculations.
1870 1	1/2+	0	0.10	(2J+1)S: Others: 0.120 26 (1975Se13), 0.08 (1968Fi05), 0.11 (1975Ca24).
1988 [§] 3				
2321 [‡] 10				

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$^{40}\text{Ar}(\text{d,p}), (\text{pol d,p}), ^2\text{H}(^{40}\text{Ar}, \text{p})$ 1988EcZY, 1975Se13, 1961Ka18 (continued) **^{41}Ar Levels (continued)**

E(level) [†]	J π [†]	L [†]	(2J+1)S [@]	Comments
2398 1	1/2-	1	0.14	(2J+1)S: Others: 0.30 5 (1975Se13), 0.25 (1968Fi05), 0.44 (1975Ca24).
2568 1				
2701 $\frac{5}{2}$ 3		1 [#]		
2733 1	3/2-	1	0.34	(2J+1)S: Others: 0.28 5 (1975Se13), 0.23 (1968Fi05), 0.31 (1971Co15).
2891 1	9/2+	4	(0.07)	L: Other: 0 (1961Ka18).
2948 1	3/2-	1	0.25	(2J+1)S: Others: 0.34 6 (1975Se13), 0.21 for L=1, J=1/2 (1968Fi05), 0.72 (1971Co15).
				J π : 1/2- proposed by 1971Co15.
3010 1	3/2-	1	0.11	
3122 $\frac{3}{2}$ 10				
3293 $\frac{5}{2}$ 5		1 [#]		
3326 1	1/2-	1	0.72	(2J+1)S: Others: 0.58 12 (2008Ga24), 0.72 12 (1975Se13), 0.57 (1968Fi05), 0.60 (1971Co15).
3388 1	(1/2)-	1	(0.09)	L: Other: 3 (1961Ka18).
3433 1	1/2-	1	0.07	
3485 $\frac{3}{2}$ 10				
3565 1				
3590 1	3/2-	1	(0.04)	L: Other: 2 (1961Ka18).
3698 1				
3734 $\frac{3}{2}$ 10				
3775 $\frac{3}{2}$ 10				
3799 1	1/2-	1	0.06	J π : (3/2-) proposed by 1975Se13.
				(2J+1)S: Other: 0.038 10 for J=1/2 (1975Se13).
3847 $\frac{5}{2}$ 5				
3900 $\frac{5}{2}$ 5				
3968 1	1/2-	1	0.57	(2J+1)S: Others: 0.72 14 (2008Ga24), 0.80 14 (1975Se13), 0.47 (1968Fi05).
4108 $\frac{5}{2}$ 6				
4123 1	3/2-	1	0.08	
4154 1	3/2-	1	0.06	
4251 $\frac{3}{2}$ 10				
4273 1	3/2-	1	0.10	(2J+1)S: Other: 0.120 24 (1975Se13).
4295 1		1	0.09	L: Other: (0) (1961Ka18).
4370 $\frac{3}{2}$ 10				
4395 $\frac{5}{2}$ 6				
4404 1	3/2-	1	0.06	
4447 $\frac{5}{2}$ 6	1/2+	0 [#]		
4473 1	(1/2-, 3/2+)	(1, 2)	(0.02, 0.02)	
4513 1	(1/2)-	1	(0.05)	
4573 1	5/2+	2	0.12	L, J π : Other: L=(3), J=(5/2-) (1975Se13).
				(2J+1)S: Other: 0.21 6 for L=3, J=5/2 (1975Se13).
4613 $\frac{5}{2}$ 7	1/2+	0 [#]		
4644 $\frac{3}{2}$ 10				
4670 1	5/2+	2	0.16	L, J π : Other: L=(3), J=(5/2) (1975Se13).
				(2J+1)S: Other: 0.33 8 for L=3, J=5/2 (1975Se13).
4683 10	(5/2-)	(3)	0.33 8	E(level), L, J π : From 1975Se13.
4722 $\frac{3}{2}$ 10				
4754 $\frac{3}{2}$ 10				
4816 $\frac{5}{2}$ 8				
4831 1	(5/2-, 9/2+)	(3, 4)	(0.15, 0.21)	L: Other: 3 (1961Ka18).
4900 $\frac{3}{2}$ 10				
4935 1	1/2-	1	0.05	L: Other: 0 (1961Ka18).
4970 1	(5/2-, 9/2+)	(3, 4)	(0.18, 0.25)	
5016 1	1/2-, 3/2-	1	0.10	J π : 1/2- (1988EcZY), 3/2- (1975Se13).
				(2J+1)S: For J=1/2 (1988EcZY). Other: 0.32 6 for J=3/2, 0.160 28 for J=1/2 (1975Se13).
5066 1	5/2-	3	(0.23)	(2J+1)S: Other: 0.48 14 (1975Se13).
5115 $\frac{3}{2}$ 10				
5134 $\frac{3}{2}$ 10				
5153 1	(9/2)+	4	(0.15)	
5219 $\frac{3}{2}$ 10				
5244 $\frac{3}{2}$ 10				
5280 $\frac{3}{2}$ 10				
5296 1				

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$^{40}\text{Ar}(\text{d,p}), (\text{pol d,p}), ^2\text{H}(^{40}\text{Ar,p})$ 1988EcZY, 1975Se13, 1961Ka18 (continued) **^{41}Ar Levels (continued)**

E(level) [†]	J π [†]	L [†]	(2J+1)S [@]	Comments
5321 1	(5/2)-	3	(0.05)	
5406 1	3/2-, 7/2-	1, 3	0.12	L: 1 (1961Ka18, 1975Se13), 3 (1988EcZY). J π : 3/2 (1975Se13), 7/2 (1988EcZY). (2J+1)S: For L=3, J=7/2 (1988EcZY). Other: 0.32 6 for J=3/2 (L=1) (1975Se13). L: Other: 1 (1961Ka18).
5438 1	5/2-	3	0.12	
5486 1	7/2-	3	0.07	
5529 $\frac{1}{2}$ 10				
5573 $\frac{3}{2}$ 10				
5618 1	(5/2)-	3	(0.12)	(2J+1)S: Other: 0.18 4 (1975Se13).
5675 $\frac{1}{2}$ 10				
5711 1	(5/2-)	3	(0.06)	
5753 1	(7/2-, 9/2+)	(3, 4)	(0.07, 0.12)	L: Other: (2) (1961Ka18).
5789 1	5/2-	3	0.15	L: Other: L=(2) (1961Ka18). (2J+1)S: Other: 0.44 8 (1975Se13).
5821 1	5/2-, 7/2-	3	0.11	L: Other: (1,2) (1961Ka18). (2J+1)S: For J=7/2. J π : 5/2- (1975Se13), 7/2- (1988EcZY).
5870 $\frac{1}{2}$ 10				
5920 1	(7/2)-	3	(0.05)	
5947 1				
5986 1	(5/2)-	3	(0.03)	
6036 1	5/2-	3	0.20	(2J+1)S: Other: 0.38 7 (1975Se13).
6088 $\frac{1}{2}$ 10				
6132 1	5/2-	3	0.30	(2J+1)S: Other: 0.80 14 (1975Se13).
6197 1	5/2-	3	0.21	
6280 1	5/2-	3	0.05	
6310 1	5/2-	3	0.08	
6345 1	(5/2)-	3	(0.08)	
6375 $\frac{1}{2}$ 10				
6419 $\frac{1}{2}$ 10				
6453 $\frac{1}{2}$ 10				
6475 1	5/2-	3	0.18	
6512 1	5/2-	3	0.12	(2J+1)S: Other: 0.33 7 (1975Se13).
6564 1	(5/2-, 7/2-)	(3)	0.55 10	L, J π : L=3, J=5/2 (1975Se13); L=(3,4), J π =(7/2-, 9/2+) (1988EcZY). (2J+1)S: For J=5/2 (1975Se13). Others: 0.73 14 for J=7/2 (1975Se13), 0.04 for J=7/2 and 0.06 for J=9/2 (1988EcZY).
6614 1	(9/2+)	(4)	0.05	
6672 $\frac{1}{2}$ 10				
6726 $\frac{1}{2}$ 10				
6762 $\frac{1}{2}$ 10				
6797 $\frac{1}{2}$ 10				
6846 $\frac{1}{2}$ 10				
6903 $\frac{1}{2}$ 10				
6959 $\frac{1}{2}$ 10				
7009 $\frac{1}{2}$ 10				
7049 $\frac{1}{2}$ 10				
7106 $\frac{1}{2}$ 10				
7170 $\frac{1}{2}$ 10				
7220 $\frac{1}{2}$ 10				
7282 $\frac{1}{2}$ 10				
7311 $\frac{1}{2}$ 10				
7351 $\frac{1}{2}$ 10				
7426 $\frac{1}{2}$ 10				
7480 $\frac{1}{2}$ 10				
7524 $\frac{1}{2}$ 10				
7595 $\frac{1}{2}$ 10				
7682 $\frac{1}{2}$ 10				
7725 $\frac{1}{2}$ 10				
7761 $\frac{1}{2}$ 10				
7818 $\frac{1}{2}$ 10				
7872 $\frac{1}{2}$ 10				
7945 $\frac{1}{2}$ 10				
7998 $\frac{1}{2}$ 10				

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$^{40}\text{Ar}(\text{d,p}), (\text{pol d,p}), ^2\text{H}(^{40}\text{Ar,p})$ 1988EcZY, 1975Se13, 1961Ka18 (continued) **^{41}Ar Levels (continued)**E(level)[†]

8030[‡] 10
 8103[‡] 10
 8153[‡] 10
 8234[‡] 10
 8277[‡] 10
 8301[‡] 10

[†] From 1988EcZY, unless otherwise stated.[‡] From 1966Ho03.[§] From 1961Ka18. Value given by 1966Ho03 is in agreement but has larger uncertainty.[#] From 1961Ka18.[@] From 1988EcZY, unless otherwise stated. Spectroscopic factors are also given by 1961Ka18 for a large number of states, but these are in a different formalism. For selected levels, values are available from 2008Ga24, 1975Se13, 1975Ca24 and 1968Fi05. **$^{40}\text{Ar}(\text{d,p}\gamma), ^2\text{H}(^{40}\text{Ar,p}\gamma)$ 1978Ra13, 1977Sc11, 1967Al02**

Other main references: 1971Me06, 1966Fo12.

1978Ra13: (d,p γ). E=2.99 MeV from tandem accelerator at University of Auckland. Measured lifetimes by DSAM, γ , p γ -coin. Protons detected with an annular surface barrier detector and γ -rays with a Ge(Li) detector. Authors only provide energy level difference in γ spectrum in Fig.3 (1978Ra13).1977Sc11: $^2\text{H}(^{40}\text{Ar,p}\gamma)$. Inverse kinematics with E(^{40}Ar) =56 MeV from UNILAC at GSI, Darmstadt. Measured E γ with a Ge(Li) detector, level energies up to 3.1 MeV. Authors only provide energy level difference in γ spectrum in Fig.1 (1977Sc11). lifetimes by DSAM.1971Me06: (d,p γ), E $_d$ =2.8 MeV from the Van de Graaff accelerator at Alger in Lyon, France. Measured γ branching, p γ (θ).1967Al02: (d,p γ) E $_d$ =3.5 MeV from Van de Graaff accelerator at Brookhaven National Laboratory. Measured γ branching with NaI(Tl) detector, charged particles were detected with a Si surface barrier detector. Also measured p γ -coin., and p γ (θ) with E $_d$ =3.2 MeV. Authors have not provided any gamma-ray transition energies.1966Fo12: (d,p γ) E $_d$ =2.8 MeV from Van de Graaff accelerator at Brookhaven National Laboratory. Protons detected with a Si surface barrier detector and the γ -rays were measured with a plastic scintillator. Measured lifetimes by p γ (t). **^{41}Ar Levels**

E(level) [†]	J π [‡]	T $_{1/2}$ [§]	Comments
0.0	7/2-		
167.3 3	5/2-	410 ps [#] 30	T $_{1/2}$: Other: >3.5 ps (1977Sc11). (1990En08).
516.1 5	3/2-	340 ps [#] 20	T $_{1/2}$: Other: >2.8 ps (1977Sc11).
1035.0 6	3/2+	5 ps +28-3	T $_{1/2}$: from 4.5 ps +277-26 from τ =6.5 +400-37 (1978Ra13). Other: >2.8 ps (1977Sc11).
1354.1 5	3/2-	0.40 ps 6	T $_{1/2}$: From weighted average of 0.44 ps 6 from τ =0.64 ps +9-8 (1977Sc11) and 0.32 ps 8 from τ =0.46 ps 12 (1978Ra13). Other: <100 ps (1966Fo12).
1869.4 10	1/2+		
2398.3 10	1/2-	0.12 ps 3	T $_{1/2}$: From τ =0.17 ps 5 (1978Ra13).
2734	3/2-	<31 fs	T $_{1/2}$: From τ <0.045 ps (1978Ra13).
2947	3/2-	<62 fs	T $_{1/2}$: From τ <0.09 ps (1978Ra13).
3010	3/2-	<111 fs	T $_{1/2}$: From τ <0.16 ps (1978Ra13).
3327	1/2-	<17 fs	T $_{1/2}$: From τ <0.025 ps (1978Ra13).
3968	1/2-	21 fs 12	T $_{1/2}$: From τ =0.030 ps 17 (1978Ra13).

[†] From $^2\text{H}(^{40}\text{Ar,p}\gamma)$ (1977Sc11) up to 2398 level. 2734 and 2947 levels are from 1971Me06. Above 3000, the values are from 1978Ra13. The decay of 3327 is from 1967Al02.[‡] From adopted levels, based on L(pol d,p) and p γ (θ).[§] From DSAM (1978Ra13), unless otherwise stated.[#] From p γ (t) (1966Fo12).

⁴⁰Ar(d,p)^γ, ²H(⁴⁰Ar,p)^γ 1978Ra13,1977Sc11,1967Al02 (continued)

^γ(⁴¹Ar)

A₂ and A₄ are from p^γ(0); values are from 1967Al02, unless otherwise stated.

E(level)	E _γ [§]	I _γ [†]	Comments
167.3	167	100	
516.1	349	28 4	
	516	100 4	A ₂ =+0.14 4, A ₄ =+0.01 5.
1035.0	519	79 9	
	868	100 9	
	1035	<36	
1354.1	838	20 3	A ₂ =+0.34 9, A ₄ =+0.09 10.
	1187	100 3	A ₂ =+0.12 5, A ₄ =-0.02 5.
	1354	4 3	
1869.4	515	100 11	
	834	53 11	
	1353	60 11	
	1702 [#]	<21	E _γ : From 1967Al02. Evaluators have considered this transition as uncertain as it was not seen in 1975Sc11.
2398.3	1044	100 7	A ₂ =+0.09 4 (1971Me06). A ₂ =+0.08 7, A ₄ =+0.02 8.
	1882	47 7	A ₂ =-0.06 7 (1971Me06). A ₂ =0.00 11, A ₄ =+0.11 12.
	2231	7 [‡] 3	
2734	864	<5.4 [‡]	
	1380	9 [‡] 5	
	2567	100 [‡] 5	A ₂ =+0.28 7 (1971Me06).
2947	1593 [#]	<8 [‡]	E _γ : From 1971Me06. Evaluators have considered this transition as uncertain as it was not seen in 1978Ra13 and 1967Al02.
	2429	67 [‡]	
	2780	100 [‡]	A ₂ =+0.08 10 (1971Me06).
3010	2842		
3327	1458	8.5 24	
	1973	13.0 24	
	2811	100.0 24	
	3160 [#]	<8.5	E _γ : From 1967Al02. Evaluators have considered this transition as uncertain as it was not seen in 1978Ra13.
3968	2614		
	3452		

[†] Relative branchings from 1967Al02, unless otherwise stated.

[‡] From 1971Me06.

[§] Level-energy differences, rounded off to nearest keV.

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

Level Scheme

Intensities: relative photon branching from each level

$^{40}\text{Ar}(^{13}\text{C}, ^{12}\text{C})$ 1989Dr03

1989Dr03:E(^{13}C)=96 MeV from 14UD Pelletron accelerator of Australian National University. Scattered particle detected with the ENGE split-pole spectrometer FWHM=400 keV. Studied reaction mechanism. DWBA calculations are compared to the data.

 ^{41}Ar Levels

E(level)	$J\pi^{\ddagger}$
0.0 [†]	7/2-
167 [†]	5/2-
1360	3/2-

[†] g.s. and 167 are unresolved.

[‡] From Adopted Levels.

 $^{208}\text{Pb}(^{40}\text{Ar}, \text{X}\gamma)$ 2011Sz02

2013Sz01: Description of the interplay between single particle and collective excitations with reference to results in 2011Sz02.

2011Sz02: ^{40}Ar beam, E=255 MeV produced from an ECR ion source and accelerated by the superconducting ALPI accelerator of the Laboratory Nazionali di Legnaro bombarded a $300 \mu\text{g}/\text{cm}^2$ ^{208}Pb . Projectile-like fragments from the multiple transfer reaction were identified by spectrometer Prisma with ΔE , E and time of flight measurements. Gamma rays detected by the Clara array, consisting of twenty-four HPGe clover-type detectors. Measured $E\gamma$, $I\gamma$, fragment- γ coincidence. Deduced levels, J, π . Comparison with *sd-pf* shell model calculations.

 ^{41}Ar Levels

E(level) [†]	$J\pi$
0.0	7/2-
167.11 9	5/2-
515.75 15	3/2-
1033.93 16	3/2+
1353.71 11	3/2-
1504.8 6	(9/2-)
1629.7 3	(11/2-)
1867.98 14	1/2+
2398.0 5	1/2-

[†] From least-square fits to $E\gamma$'s.

 $\gamma(^{41}\text{Ar})$

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$	$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$	$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$
167.1 1	167.11	36.8 18	833.8 2	1867.98	1.0 5	1353.3 3	1867.98	1.0 10
348.7 2	515.75	5.4 5	837.5 3	1353.71	7.2 5	1353.6 2	1353.71	4.1 11
514.2 1	1867.98	1.2 5	866.7 2	1033.93	5.8 5	1504.8 [‡] 6	1504.8	3.2 4
516.0 3	515.75	15.5 17	1044.3 4	2398.0	3.1 4	1629.7 [‡] 3	1629.7	11.6 67
517.9 3	1033.93	3.7 5	1186.6 1	1353.71	36.3 14			

[†] All gamma energies are from adopted gammas except as noted.

[‡] From 2011Sz02.

[§] Gamma ray intensities reported are from private communication in 2015SzZZ.

$^{208}\text{Pb}(^{40}\text{Ar},\text{X}\gamma)$ 2011Sz02 (continued)

Level Scheme

 Intensities: relative I_γ

Adopted Levels, Gammas

Q(β^-)=-421.66 14; S(n)=10095.37 6; S(p)=7808.615 5; Q(α)=-6222.94 5 2012Wa38.

S(2n)=17894.990 10; S(2p)=20337.3 17 (2012Wa38).

See ⁴⁰Ar(p, γ) dataset for primary E γ 's and branching ratios for about 45 resonances in a total of about 293 resonances listed in the range: E(p)(lab)=551 to 2958 keV.

See ⁴⁰K(n, γ) E=thermal dataset for primary E γ 's and I γ 's from thermal neutron capture state.

See ⁴⁰Ar(p,p),(p, α),(p,n): resonances dataset for relevant parameters for about 250 resonances from E(p)(lab)=1086 to 5320 keV.

See ⁴⁰K(n,p),(n, α):resonances dataset for relevant parameters for about 40 resonances from E(n)(lab)=1.128 to 69 keV.

41K Levels**Cross Reference (XREF) Flags**

A ⁴¹ Ar β^- Decay (109.61 min)	I ⁴⁰ Ar(³ He,d)	⁴² Ca(d, ³ He)
B ² H(⁴⁰ Ar,n γ)	J ⁴⁰ K(n, γ) E=thermal	⁴² Ca(t, α)
C ²⁶ Mg(¹⁸ O,p2n γ), ²⁷ Al(¹⁶ O,2p γ)	K ⁴⁰ Ar(d,n γ)	⁴² Ca(¹³ C, ¹⁴ N)
D ³⁷ Cl(α , γ): 3817 Resonance	L ⁴¹ K(e,e')	⁴⁴ Ca(p, α),(p, α γ)
E ³⁸ Ar(α ,p γ)	M ⁴¹ K(p,p' γ),(p,p')	⁴¹ Ca ϵ Decay (9.94 $\times 10^4$ y)
F ³⁹ K(t,p γ)	N ⁴¹ K(n,n' γ)	³⁷ Cl(α , γ): 4013 Resonance
G ⁴⁰ Ar(p, γ)	O Others:	⁴² Ca(μ^- , $\nu n\gamma$)
H ⁴⁰ Ar(d,n)	Coulomb Excitation	

E(level) [†]	J π	XREF	T _{1/2}	Comments
0.0	3/2+	ABCDEFGHIJKLMNO	stable	Q=+0.0711 5 (1998Ke05); μ =+0.21487009 22 (1974Be50). Q: Mossbauer effect, recalculated by 1998Ke05. Others: +0.073 2 Mossbauer effect, recalculated by 1993Su05, +0.060 5 Mossbauer effect, recalculated by 1971St12, 1969Ne03, 1967Bo40, 1960Bl15, 1953Le33. μ : atomic-beam resonance method (1974Be50). Others: +0.21489274 12 (NMR 1974Sa24,1974Sa25), 0.2154 10 (1982To02), 1967Lu02, 1954Br09, 1936Ma03. J π : spin from atomic beam resonance method (1936Ma03). Parity from L(³ He,d)=L(d, ³ He)=2. B(E2) $\uparrow$ =0.0016 4. B(E2) $\uparrow$: weighted av of 0.0024 4 from (e,e') and 0.0029 10 and 0.00139 20 both from Coulomb Excitation. T _{1/2} : the measured T _{1/2} values cluster into groups of values which differ significantly. The evaluators have adopted the weighted average of 0.35 ps 14 from ² H(⁴⁰ Ar,n γ), 0.29 ps +21-10 from ³⁹ K(t,p γ), and 0.25 ps +14-10 from ⁴⁰ Ar(d,n γ) as they form the most consistent set of measured values. There are also several measurements which indicate a larger half-life including >6.9 ps from ³⁷ Cl(α , γ): 3817 Resonance, 3.5 ps 10 from ³⁸ Ar(α ,p γ), and >2.4 ps from ⁴¹ K(p,p' γ),(p,p'). Other: 76 fs +21-4 from ⁴⁰ Ar(p, γ). J π : from L(d,n)=L(³ He,d)=L(d, ³ He)=L(t, α)=0. μ =+4.42 5 (1969Bl07). μ : γ (θ ,H,t), Time-dependent PAD method (1969Bl07). Other: +4.52 10 (1975Bo44). J π : L(d,n)=L(³ He,d)=L(d, ³ He)=L(t, α)=3; γ (θ ,pol) in (α ,p γ). T _{1/2} : weighted average of 6.7 ns 5 from ⁴¹ Ar β^- decay (109.61 min), 8.1 ns 11 from ²⁶ Mg(¹⁸ O,p2n γ), ²⁷ Al(¹⁶ O,2p γ), 8.3 ns 7 from ⁴⁰ Ar(p, γ), 7.35 ns 20 from ⁴¹ K(p,p' γ),(p,p) Others: >3.5 ps from ² H(⁴⁰ Ar,n γ), >3.1 ps from ³⁷ Cl(α , γ): 3817 Resonance, >3.1 ps from ³⁸ Ar(α ,p γ), >3.5 ps from ³⁹ K(t,p γ).
980.476 8	1/2+	B DEFGHIJKLMNO	0.30 ps 10	
1293.609 8	7/2-	ABCDEFGHIJKLMNO	7.35 ns 20	

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Adopted Levels, Gammas (continued)
⁴¹K Levels (continued)

E(level) [†]	J π	XREF	T _{1/2}	Comments
1559.903 12	3/2+	B DEFG JK MNo	0.38 ps 5	J π : from $\gamma(\theta, \text{pol})$ in ³⁸ Ar($\alpha, \text{p}\gamma$). T _{1/2} : weighted average of 0.42 ps +20-14 from ² H(⁴⁰ Ar, n γ), 0.42 ps 10 from ³⁸ Ar($\alpha, \text{p}\gamma$), 0.40 ps 15 from ³⁹ K(t, $\text{p}\gamma$), 0.35 ps 5 from ⁴⁰ Ar(p, γ), 0.35 ps 15 from ⁴⁰ Ar(d, n γ), 0.49 ps 14 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'). Other: 0.87 ps 28 from ³⁷ Cl(α, γ): 3817 Resonance, 0.59 ps 17 from ³⁷ Cl(α, γ): 4013 Resonance.
1582.001 11	3/2-	B DEFG IJK MNo	9.3 ps 4	J π : from L(³ He, d)=1 and $\gamma(\theta, \text{pol})$ in ³⁸ Ar($\alpha, \text{p}\gamma$). T _{1/2} : from ⁴⁰ Ar(p, γ). Others: >2.1 ps from ² H(⁴⁰ Ar, n γ), >1.7 ps from ³⁷ Cl(α, γ): 3817 Resonance, >3.1 ps from ³⁸ Ar($\alpha, \text{p}\gamma$), >1 ps from ³⁹ K(t, $\text{p}\gamma$), >1 ps from ⁴⁰ Ar(d, n γ), >2.8 ps from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'), >1.4 ps from ³⁷ Cl(α, γ): 3817 Resonance.
1593.107 12	1/2+	B EFG JK MNo	88 fs 28	J π : $\gamma(\theta)$ allows 1/2, 3/2; 551 γ from 5/2+; L(d, ³ He)=0+1+2 for the unresolved triplet of levels 1560(L=2), 1582(L=1), 1593(L=0). T _{1/2} : weighted average of 97 fs 35 from ³⁸ Ar($\alpha, \text{p}\gamma$) and 83 fs 28 from ⁴⁰ Ar(d, n γ). Others: 130 fs 50 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'), <0.24 ps from ⁴⁰ Ar(p, γ), 0.30 ps 9 from ³⁷ Cl(α, γ): 4013 Resonance.
1677.235 11	7/2+	ABCDEFGH JK MNO	1.4 ps 3	J π : from $\gamma(\theta, \text{pol})$ in ²⁶ Mg(¹⁸ O, p2n γ), ²⁷ Al(¹⁶ O, 2p γ) and ³⁸ Ar($\alpha, \text{p}\gamma$). T _{1/2} : weighted average of 1.6 ps 4 from ³⁸ Ar($\alpha, \text{p}\gamma$) and 1.25 ps 35 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'). Others: 5.4 ps 22 from ²⁶ Mg(¹⁸ O, p2n γ), ²⁷ Al(¹⁶ O, 2p γ), >2.8 ps from H(⁴⁰ Ar, n γ), >1.4 ps from ³⁷ Cl(α, γ): 3817 Resonance, >3.5 ps from ³⁹ K(t, $\text{p}\gamma$), >0.17 ps from ⁴⁰ Ar(p, γ), >4.9 ps from ⁴⁰ Ar(d, n γ), 2.7 ps 17 from ³⁷ Cl(α, γ): 4013 Resonance.
1698.005 15	5/2+	B DEFGHIJK MNO	0.85 ps 21	J π : from $\gamma(\theta, \text{pol})$ in ³⁸ Ar($\alpha, \text{p}\gamma$). T _{1/2} : weighted average of 0.83 ps 21 from ³⁸ Ar($\alpha, \text{p}\gamma$), 0.90 ps 28 from ³⁹ K(t, $\text{p}\gamma$), and 0.83 ps 21 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'). Others: 0.07 ps +14-7 from ² H(⁴⁰ Ar, n γ), 1.4 ps 7 from ³⁷ Cl(α, γ): 3817 Resonance, 49 fs 28 from ⁴⁰ Ar(p, γ), 0.24 ps 6 from ⁴⁰ Ar(d, n γ), 0.83 ps 28 from ³⁷ Cl(α, γ): 4013 Resonance.
2143.82 2	5/2+	B DEFG JK MNo	0.24 ps 6	J π : 3/2+, 5/2+ from $\gamma(\theta, \text{pol})$ in ³⁸ Ar($\alpha, \text{p}\gamma$), γ from 7/2-. T _{1/2} : weighted average of 0.55 ps +21-14 from ² H(⁴⁰ Ar, n γ), 0.25 ps 9 from ⁴⁰ Ar(d, n γ), 0.21 ps 6 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'). Others: 0.29 ps 6 from ³⁷ Cl(α, γ): 3817 Resonance, 76 fs 21 from ³⁸ Ar($\alpha, \text{p}\gamma$), <0.18 ps from ⁴⁰ Ar(p, γ), 0.25 ps 7 from ³⁷ Cl(α, γ): 4013 Resonance.
2166.70 2	3/2-	B DEFG IJK MNo	1.9 ps 2	J π : 3/2 from $\gamma(\theta)$ in ³⁸ Ar($\alpha, \text{p}\gamma$), π from L(³ He, d)=1. T _{1/2} : weighted average of 1.7 ps 6 from ³⁸ Ar($\alpha, \text{p}\gamma$), 1.94 ps 14 from ⁴⁰ Ar(p, γ). Others: >2.1 ps from ² H(⁴⁰ Ar, n γ), >1.25 ps from ³⁷ Cl(α, γ): 3817 Resonance, >2.1 ps from ⁴⁰ Ar(d, n γ), 0.22 ps 8 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'), 1.5 ps 7 from ³⁷ Cl(α, γ): 4013 Resonance.
2316.62 2	5/2-	B DEFG IJK MNO	0.57 ps 14	J π : from L(³ He, d)=3 and $\gamma(\theta, \text{pol})$ in ³⁸ Ar($\alpha, \text{p}\gamma$). T _{1/2} : weighted average of 0.54 ps 15 from ³⁸ Ar($\alpha, \text{p}\gamma$) and 0.59 ps 14 from ⁴¹ K(p, $\text{p}'\gamma$), (p, p'). Others: 0.34 ps 10 from ³⁷ Cl(α, γ): 3817 Resonance, <0.21 ps from ⁴⁰ Ar(p, γ), 0.062 ps 21 from ⁴⁰ Ar(d, n γ), 0.18 ps 10 from ³⁷ Cl(α, γ): 4013 Resonance.

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Adopted Levels, Gammas (continued) ^{41}K Levels (continued)

E(level) [†]	J π	XREF	T _{1/2}	Comments
2440.18 5	(3/2-, 5/2+)	D G J MNo	0.083 ps 35	J π : from 847 γ to 1/2+ and RUL for 742 γ to 5/2+. T _{1/2} : from $^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$. Others: 0.16 ps 3 from $^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance, 0.15 ps 3 from $^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance.
2447.83 7	(3/2+, 5/2-, 7/2+)	B F J o		J π : from 2448 γ to 3/2+; 2376 γ from (7/2+, 9/2+).
2494.91 3	9/2+	DEFG J M O	>3.1 ps	J π : from $\gamma(\theta, \text{pol})$ in $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. T _{1/2} : from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. Others: >2.1 ps from $^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance, >2.8 ps from $^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$, 1.7 ps 10 from $^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance.
2507.93 3	7/2+	DEFG J MNO	0.15 ps 4	J π : from $\gamma(\theta, \text{pol})$ in $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. T _{1/2} : weighted average of 0.16 ps 6 from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$ and 0.15 ps 4 from $^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$. Others: 0.43 ps 10 from $^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance, 0.29 ps 6 from $^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance.
2527.66 3	11/2+	C EFG J	151 ps 4	$\mu=4.5$ 10 (1981Le19). μ : $\gamma(\theta, \text{H}, \text{t})$, recoil into gas or vacuum (1981Le19). J π : from $\gamma(\theta, \text{pol})$ in $^{38}\text{Ar}(\alpha, \text{p}\gamma)$ and $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$. T _{1/2} : from $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$. Other: >3.1 ps from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$, >4.9 ps from $^{39}\text{K}(\text{t}, \text{p}\gamma)$.
2593.97 3	1/2-, 3/2-	D G IJ M O	7.6 fs 42	J π : from L($^3\text{He}, \text{d}$)=1. 1/2- is favored in (p,p' γ) from comparisons with Hauser-Feshbach calculations, but 3/2- is favored by γ from 5/2+ resonance in (p, γ). T _{1/2} : from $^{40}\text{Ar}(\text{p}, \gamma)$. Other: 0.19 ps 8 from $^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance..
2676.1 7	1/2+	G I M O		J π : from L($^3\text{He}, \text{d}$)=L(d, ^3He)=0.
2710.48 7	3/2+, 5/2+	G IJ No		J π : from L($^3\text{He}, \text{d}$)=2.
2712.57 3	(7/2)-	DEFG J MNO	0.54 ps 15	J π : $\gamma(\theta, \text{pol})$ in ($\alpha, \text{p}\gamma$) give 3/2-, 7/2-. γ from (7/2+). T _{1/2} : weighted average of 0.52 ps 15 from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$ and 0.59 ps 28 from $^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$. Others: 0.62 ps 28 from $^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance, <0.54 ps from $^{40}\text{Ar}(\text{p}, \gamma)$, 0.83 ps 35 from $^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance.
2756.73 3	5/2+	DEFG IJ MNo	52 fs 21	J π : from L($^3\text{He}, \text{d}$)=2; 1079 γ to 7/2+, 1463 γ to 7/2-.
2761.73 3	11/2-	BCDE J MNO	0.48 ps 6	T _{1/2} : from $^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$. Others: <31 fs from $^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance, <69 fs from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. J π : from $\gamma(\theta, \text{pol})$ in $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. T _{1/2} : weighted average of 0.48 ps 6 from $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$, 0.46 ps 12 from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$ and 0.53 ps 21 from $^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$.
2774.25 3	13/2+	C EF J	51.3 ps 16	$\mu=3.0$ 5 (1981Le19, 1989Ra17). μ : $\gamma(\theta, \text{H}, \text{t})$, recoil into gas or vacuum (1981Le19). J π : from $\gamma(\theta, \text{pol})$ in $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. T _{1/2} : from $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$. Other: >3.1 ps from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$.
3048.22 5	1/2-, 3/2-	G IJ MN		J π : from L($^3\text{He}, \text{d}$)=1. 1/2- is favored in (p,p' γ) from comparisons with Hauser-Feshbach calculations, but 3/2- is favored by γ from from 5/2+ resonance in (p, γ).
3141.84 3	(7/2-)	fgh J m		J π : from 380 γ to 11/2, 385 γ to 5/2+, and 825 γ to 5/2-.

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Adopted Levels, Gammas (continued)

 ^{41}K Levels (continued)

E(level) [†]	J π	XREF	T _{1/2}	Comments
3142.43 3	5/2-	B DEFgh J mNO	0.15 ps 6	J π : 5/2-, 9/2- from $\gamma(0, \text{pol})$ in $^{38}\text{Ar}(\alpha, \text{p}\gamma)$, 998 γ to 5/2+ and 381 γ to 11/2-. T _{1/2} : weighted average of 0.16 ps 6 from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$ and 0.12 ps 8 from $^{41}\text{K}(\text{p}, \text{p}'\gamma), (\text{p}, \text{p}')$. Others: 0.08 ps 5 from $^{37}\text{Cl}(\alpha, \gamma)$: 3817 Resonance, 0.17 ps 4 from $^{37}\text{Cl}(\alpha, \gamma)$: 4013 Resonance.
3162.2 8		M	<21 fs	E(level), T _{1/2} : from $^{41}\text{K}(\text{p}, \text{p}'\gamma), (\text{p}, \text{p}')$. J π : 1/2 is favored from Hauser-Feshback analysis.
3179.8 2	3/2+, 5/2+	G O		E(level): from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from L(d, ^3He)=2.
3213.61 4	5/2-	B FG IJ MN	125 fs 55	J π : from L($^3\text{He}, \text{d}$)=3; 1631 γ to 3/2-, 3214 γ to 3/2+.
3229.8 6	(1/2+, 3/2, 5/2+)	G o		T _{1/2} : from $^{41}\text{K}(\text{p}, \text{p}'\gamma), (\text{p}, \text{p}')$. E(level): from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from 1670 γ to 3/2+, 2249 γ to 1/2+, primary γ from 5/2+.
3235.57 4	(3/2-, 5/2, 7/2-)	EFG J M o	38 fs 35	J π : from 1942 γ to 7/2-, 3786 γ from (3/2-).
3240.65 4	(5/2+, 7/2-)	J o		T _{1/2} : from $^{41}\text{K}(\text{p}, \text{p}'\gamma), (\text{p}, \text{p}')$. J π : from 746 γ to 9/2+ and 2838 γ from (3/2-).
3277.9 5	(1/2, 3/2, 5/2+)	G M	76 fs 69	XREF: M(3281.7). J π : from possible 2297 γ to 1/2+.
3431.84 4	(9/2-, 7/2-)	J		T _{1/2} : from $^{41}\text{K}(\text{p}, \text{p}'\gamma), (\text{p}, \text{p}')$. J π : from 670 γ to 11/2- and 1115 γ to 5/2-. 7/2- is unlikely from RUL for [E2] γ to 11/2-.
3450.1 2	5/2-, 7/2-	G IJ N	4.2 fs 28	E(level), T _{1/2} : from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from L($^3\text{He}, \text{d}$)=3.
3480? 10	5/2-, 7/2-	I		J π : from L($^3\text{He}, \text{d}$)=3.
3488.5 3	(5/2)+	G J NO	<3.5 fs	E(level): 3480, L=2 in (d, ^3He). J π : from L(d, ^3He)=2, 2194 γ to 7/2-.
3521.38? 9	(5/2+, 7/2+)	J		T _{1/2} : from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from 1026 γ to 9/2+ and 3521 γ to 3/2+.
3534.45 4	(7/2+, 9/2, 11/2+)	J		J π : from 1026 γ to 7/2+ and 1007 γ to 11/2+.
3560.61 5	(3/2-, 5/2, 7/2+)	J		J π : from 419 γ to (7/2-) and 3561 γ to 3/2+.
3572.38 5		G J N		
3578.3 4	(3/2+, 5/2, 7/2+)	N		J π : from 1900 γ to 7/2+ and 2018 γ to 3/2+.
3579.2 5		G		
3612.77 5		G iJ		J π : L($^3\text{He}, \text{d}$)=1 for 3619 10 group corresponds 3612.77 and/or 3626.1 level.
3626.1 5		G i		J π : L($^3\text{He}, \text{d}$)=1 for 3619 10 group corresponds 3612.77 and/or 3626.1 level.
3651.46 5	(5/2, 7/2-)	G J N		J π : from 1974 γ to 7/2+, 2358 γ to 7/2-, 593 γ from (3/2)-.
3740.1 10	1/2-, 3/2-	G I		E(level): from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from L($^3\text{He}, \text{d}$)=1.
3761.54 5		G J N	4.9 fs 28	T _{1/2} : from $^{40}\text{Ar}(\text{p}, \gamma)$.
3774.66 5	5/2-, 7/2-	G IJ		XREF: I(3773). J π : from L($^3\text{He}, \text{d}$)=3; but 2794 γ to 1/2+ disfavors 7/2-.
3819 10	1/2-, 3/2-	I		J π : from L($^3\text{He}, \text{d}$)=1.
3826.90 10	(5/2, 7/2+)	J N		J π : from 685 γ to (7/2-), 2150 γ to 7/2+, 3827 γ to 3/2+.
3861.3 5	(1/2, 3/2, 5/2+)	G		E(level): from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from 2882 γ to 1/2+.
3870.52 6	5/2-, 7/2-	IJ		XREF: I(3858). J π : from L($^3\text{He}, \text{d}$)=3.
3897.0 5	(11/2, 15/2)	C E	0.31 ps 8	J π : from $\gamma(0)$ in $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$. T _{1/2} : from $^{38}\text{Ar}(\alpha, \text{p}\gamma)$. Other: >0.14 ps from $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$.
3911.7 6	1/2-, 3/2-	G I		E(level): from $^{40}\text{Ar}(\text{p}, \gamma)$. J π : from L($^3\text{He}, \text{d}$)=1.
3990.40? 5		J		

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Adopted Levels, Gammas (continued)
⁴¹K Levels (continued)

E(level) [†]	J π	XREF	T _{1/2}	Comments
3996.49 4	(5/2+)	J NO	97 fs 35	J π : from 2319 γ to 7/2+, 2703 γ to 7/2-, 3016 γ to 1/2+.
4026.7 5		G i		T _{1/2} : from ³⁷ Cl(α , γ): 4013 Resonance.
4026.94 7		iJ		J π : L(³ He,d)=2 for a 4032 10 group gives 3/2+,5/2+.
4075 10			O	J π : L(³ He,d)=2 for a 4032 10 group gives 3/2+,5/2+.
4146.15 6	5/2-, 7/2-	IJ		J π : from L(³ He,d)=3.
4164.57 4		G J		
4220.62 5	(5/2)	J N		J π : from 2543 γ to 7/2+, 2927 γ to 7/2-, 4221 γ to 3/2+, 1858 γ from (3/2)-.
4228.99 5	(5/2)-	IJ N		XREF: I(4237).
4244.22 5	(3/2)-	IJ		J π : from L(³ He,d)=3, 1721 γ to 7/2+, 2935 γ to 7/2-.
4260.36 13		J		XREF: I(4237).
4274.2 3	15/2-	C E	0.10 ps 6	J π : from L(³ He,d)=1, 2951 γ to 7/2-.
4274.96 5	(7/2-, 9/2+)	J o		J π : from γ (θ ,pol) in ²⁶ Mg(¹⁸ O,p2n γ), ²⁷ Al(¹⁶ O,2p γ).
4303.01 5	(5/2+, 7/2+)	J No		T _{1/2} : from ³⁸ Ar(α ,p γ). Other: <0.14 ps from ²⁶ Mg(¹⁸ O,p2n γ), ²⁷ Al(¹⁶ O,2p γ).
4340.9 5	(1/2, 3/2, 5/2)	G i		J π : from 1809 γ to 9/2+, 4303 γ to 3/2+.
4345.66 5	(5/2, 7/2-)	iJ N		J π : from 4341 γ to 3/2+; primary γ from 3/2-; L(³ He,d)=3 for 4339 10 level.
4400 20	3/2+, 5/2+	H O		J π : from 2669 γ to 7/2+, 2763 γ to 3/2-, 3052 γ to 7/2-; L(³ He,d)=3 for 4339 10 level.
4459.72 5	1/2-, 3/2-	IJ		J π : from L(d, ³ He)=2.
4478 10	1/2-, 3/2-	I		XREF: I(4443).
4525.37 5		J		J π : from L(³ He,d)=1.
4568.75 5	(9/2+, 11/2-)	J		J π : from L(³ He,d)=1.
4587 10	5/2-, 7/2-	I		J π : from 294 γ to (7/2-, 9/2+), 1795 γ to 13/2+.
4609.48 7	(5/2+, 7/2, 9/2+)	J		J π : from L(³ He,d)=3.
4661 10		I		J π : from 1853 γ to 5/2+ and 2114 γ to 9/2+.
4674 3		G		E(level): doublet.
4730.70 5	(3/2)-	IJ		J π : from L(³ He,d)=1; 3437 γ to 7/2-.
4735.86 6	(5/2+, 7/2+)	J		J π : from 2241 γ to 9/2+, 4736 γ to 3/2+.
4745.49 10	(5/2+)	G J		J π : from 2250 γ to 9/2+, 3164 γ to 3/2-, 4745 γ to 3/2+.
4749.47 8	(3/2-, 5/2, 7/2+)	J		J π : from 3456 γ to 7/2-, 4749 γ to 3/2+.
4823.33 5	(7/2+, 9/2+)	J		J π : from 2066 γ to 5/2+ and 2996 γ to 11/2+.
4848.5 5	(3/2)-	G I		J π : from L(³ He,d)=1; 2705 γ to 5/2+.
4862.43 6	(3/2+, 5/2)	J		J π : from 2268 γ to 1/2-, 3/2-, 3185 γ to 7/2+, 4862 γ to 3/2+.
4922 10		I o		J π : L(³ He,d)=1+3 implies 1/2-, 3/2- and 5/2-, 7/2- doublet.
4927.83 6	(5/2)+	J o		E(level): this group is most likely different from 4927.8 level.
4948.94 6	(3/2-, 5/2, 7/2-)	J		E(level): 4900, L=2 in (d, ³ He). In (p, α) E=4900 corresponds to 4922 and/or 4928.
4962.3 5	(1/2, 3/2, 5/2)	G		J π : from L(d, ³ He)=2; 3253 γ to 7/2+, 3335 γ to 1/2+, 3634 γ to 7/2-.
4982.9 2	19/2-	C E	70.7 ps 21	J π : from 3367 γ to 3/2-, 3655 γ to 7/2-.
4995 10	5/2-, 7/2-	I		J π : from 4962 γ to 3/2+; primary γ from 3/2- (1102) resonance in (p, γ).
5021.23? 8		J		μ =7.0 29 (1981Le19,1989Ra17).
5060 20	3/2+, 5/2+		O	μ : γ (θ ,H,t), recoil into gas or vacuum (1981Le19).
5091 10	1/2-, 3/2-	I o		J π : from γ (θ ,pol) in ²⁶ Mg(¹⁸ O,p2n γ), ²⁷ Al(¹⁶ O,2p γ).
				T _{1/2} : from ²⁶ Mg(¹⁸ O,p2n γ), ²⁷ Al(¹⁶ O,2p γ). Other: >3.1 ps from ³⁸ Ar(α ,p γ).
				J π : from L(³ He,d)=3.
				J π : from L(d, ³ He)=2.
				J π : from L(³ He,d)=1.

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Adopted Levels, Gammas (continued)
⁴¹K Levels (continued)

E(level) [†]	J π	XREF	Comments
5096.20 8		J o	
5101.2 20	1/2-, 3/2-	G I o	J π : from L(³ He,d)=1.
5129.4? 5		N	
5160 10	5/2-, 7/2-	I o	J π : from L(³ He,d)=3.
5185.27 6	(5/2, 7/2-)	J	J π : from 455 γ to 3/2-, 2677 γ to 7/2+; primary γ from 7/2-, 9/2-.
5235 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5270 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5298.86 6	(3/2-, 5/2, 7/2-)	J	J π : from 568 γ to 3/2-, 3155 γ to 5/2+; primary γ from 7/2-, 9/2-.
5335 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5401.7 5	1/2-, 3/2-	G I	J π : from L(³ He,d)=1.
5448 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5496.61 7	(7/2+)	J N	J π : from 2969 γ to 11/2+, 5496 γ to 3/2+.
5543 10		I	J π : doublet group in (³ He,d) assigned as L=1+3. The L=1 component may be associated with 5557.38 level.
5548.19 7	(3/2+, 5/2+, 7/2+)	J o	J π : from 3871 γ to 7/2+, 5548 γ to 3/2+.
5557.39 9		IJ o	
5575.24? 8	(3/2-, 5/2, 7/2+)	J o	J π : from 2863 γ to (7/2)-, 5574 γ to 3/2+.
5604.58 8	(3/2-, 5/2, 7/2+)	J	J π : from 5604 γ to 3/2+; primary γ from 7/2-, 9/2-.
5610.83 6	(5/2, 7/2+)	J	J π : from 3933 γ to 7/2+, 5610 γ to 3/2+; primary γ from 7/2-, 9/2-.
5620 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5655.66 8	(3/2-, 5/2+)	IJ N	XREF: I(5669). J π : from 2514 γ to (7/2)-, 4063 γ to 1/2+.
5659.25 8	(3/2-, 5/2, 7/2+)	IJ	XREF: I(5669). J π : from 5659 γ to 3/2+; primary γ from 7/2-, 9/2-.
5717 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5800.80 7	(3/2+, 5/2+)	J	J π : from 3293 γ to 7/2+, 4820 γ to 1/2+.
5816 10	1/2+	I	J π : from L(³ He,d)=0.
5826.66 7	(5/2)+	J O	J π : from L(d, ³ He)=2, 4533 γ to 7/2-.
5852 10	5/2-, 7/2-	I	J π : from L(³ He,d)=3.
5886.95 8	(3/2)-	IJ	J π : from L(³ He,d)=1, 3130 γ to 5/2+.
5912.50 8	(9/2+)	J N	J π : from 2671 γ to (5/2+, 7/2-), 3138 γ to 13/2+.
5933 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
5952.41 8	(7/2-, 9/2-)	J	J π : from 2810 γ to 5/2-, 3191 γ to 11/2-, primary γ from 7/2-, 9/2-.
5968.89 8	(9/2+, 11/2-)	J	J π : from 3195 γ to 13/2+; primary γ from 7/2-, 9/2-.
5986 10	(1/2 to 7/2)-	I	E(level), J π : doublet: (1/2, 3/2)- and (5/2, 7/2)- from L(³ He,d)=1+3.
6040.67 10	(3/2-, 5/2, 7/2)	J N	J π : from 3283 γ to 5/2+, 3724 γ to 5/2-; primary γ from 7/2-, 9/2-.
6062 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
6070.76 9	(5/2, 7/2, 9/2+)	J	J π : from 4373 γ to 5/2+, 4777 γ to 7/2-, primary γ from 7/2-, 9/2-.
6078.56 7	(3/2)-	IJ	J π : from L(³ He,d)=1; primary γ from 7/2-, 9/2-.
6109 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
6186.04 11	(5/2, 7/2, 9/2-)	J	J π : from 3043 γ to 5/2-, 4510 γ to 7/2+, primary γ from 7/2-, 9/2-.
6190 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
6211.50 7	(7/2+, 9/2-)	J	J π : from 3684 γ to 11/2+, 3895 γ to 5/2-.
6229.88? 10	(3/2-, 5/2, 7/2-)	J	J π : from 1771 γ to 1/2-, 3/2-, primary γ from 7/2-, 9/2-.
6255.96 8	(5/2, 7/2-)	J	J π : from 3748 γ to 7/2+, 4674 γ to 3/2-, primary γ from 7/2-, 9/2-.
6261 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
6290.05 14	(3/2)-	IJ	XREF: I(6303). J π : from L(³ He,d)=1, primary γ from 7/2-, 9/2-.
6350 10	5/2-, 7/2-	I	J π : from L(³ He,d)=3.
6394.31 10	(3/2-, 5/2, 7/2-)	J	J π : from 4227 γ to 3/2-; primary γ from 7/2-, 9/2-.
6434.51 9	(3/2-, 5/2, 7/2-)	J	J π : from 3386 γ to 1/2-, 3/2-, primary γ from 7/2-, 9/2-.
6450.15? 10	(3/2-, 5/2, 7/2+)	J	J π : from 3386 γ to 1/2-, 3/2-, primary γ from 7/2-, 9/2-.
6497.00 10	(3/2)-	IJ	J π : from L(³ He,d)=1; 5203 γ to 7/2-.
6528.13 9	(3/2-, 5/2, 7/2-)	J O	XREF: O(6500). J π : from 1065 γ from (3/2)-; primary γ from 7/2-, 9/2-. L(d, ³ He)=2 supports 5/2+.
6601 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
6630 20	3/2+, 5/2+	O	J π : from L(d, ³ He)=2.
6654 10	1/2-, 3/2-	I	J π : from L(³ He,d)=1.
6704 10	5/2-, 7/2-	I	J π : from L(³ He,d)=3.
6769.77 10	(3/2-, 5/2, 7/2-)	J	J π : from 4176 γ to 1/2-, 3/2-, 5476 γ to 7/2-.
6782.54 10		J	
6791.36 9	(5/2, 7/2-)	J	J π : from 904 γ to (3/2)-, 5115 γ to 7/2+, primary γ from 7/2-, 9/2-.

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Adopted Levels, Gammas (continued) ^{41}K Levels (continued)

E(level) [†]	J π	XREF	Comments
6809 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
6835.43 9	(5/2, 7/2-)	J	J π : from 4668 γ to 3/2-, 5158 γ to 7/2+, 5542 γ to 7/2-.
6874 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
6919 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
6980 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
6995.53 11	(5/2, 7/2, 9/2+)	J	J π : from 4238 γ to 5/2+, 5319.5 γ to 7/2+; primary γ from 7/2-, 9/2-.
7020.97 10	(3/2)-	IJ	XREF: I(7037).
7035.28 14	(5/2)-	IJ	J π : from L($^3\text{He},d$)=1, 3025 γ to (5/2+), 5727 γ to 7/2-.
			XREF: I(7037).
			J π : from L($^3\text{He},d$)=3, 5476 γ to 3/2+.
7085 10	5/2-, 7/2-	I	J π : from L($^3\text{He},d$)=3.
7159 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
7232 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
7319 10	(1/2 to 7/2)-	I	J π , E(level): doublet: (1/2, 3/2)- and (5/2, 7/2)- from L($^3\text{He},d$)=1+3.
7361.15? 11	(3/2-, 5/2, 7/2-)	J	J π : from 5777 γ to 3/2-; primary γ from 7/2-, 9/2-.
7420 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
7471 10	5/2-, 7/2-	I	J π : from L($^3\text{He},d$)=3.
7511 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
7593.06 9		J	
7617 10	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
7654.93 9	(3/2-, 5/2, 7/2-)	J	J π : from 3380 γ to (7/2-, 9/2+), 3411 γ to (3/2-).
7836 15	(1/2-, 3/2, 5/2+)	I	J π : from L($^3\text{He},d$)=(1), 2.
7893 15	(1/2-, 3/2, 5/2+)	I	J π : from L($^3\text{He},d$)=(1), 2.
7938.98 10		IJ M	XREF: I(7940).
8041 15		I O	E(level): 8000 in (d, ^3He). J π : L($^3\text{He},d$)=(3) gives (5/2-, 7/2-); but L(d, ^3He)=(2) gives (3/2+, 5/2+). There may be two levels near this energy.
8116 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
8152 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
8190.21 12	(3/2-, 5/2, 7/2-)	J	J π : from 3945 γ to (3/2-); primary γ from 7/2-, 9/2-.
8200.11 9	(5/2-, 7/2-, 3/2+)	IJ	XREF: I(8229).
			J π : from 2121 γ to (3/2)-, 6522 γ to 7/2+; L($^3\text{He},d$)=(3).
8268 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
8349 15	5/2-, 7/2-	I O	T=3/2. J π : from L($^3\text{He},d$)=L(p, α)=3. E(level): IAR of g.s., 7/2- in ^{41}Ar .
8464 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
8548 15	(5/2-, 7/2-)	I	J π : from L($^3\text{He},d$)=(3).
8660 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
8748 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
8801 15	(1/2-, 3/2-)	I	J π : from L($^3\text{He},d$)=(1).
8873 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
9050 15	(1/2-, 3/2-)	I	J π : from L($^3\text{He},d$)=(1).
9116 15	(5/2-, 7/2-)	I	J π : from L($^3\text{He},d$)=(3).
9203 15	(1/2 to 7/2-)	I	J π : from L($^3\text{He},d$)=(1), 3.
9243 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
9376 15	(3/2+, 5/2+)	I	J π : from L($^3\text{He},d$)=(2).
9420 50	3/2+, 5/2+	O	T=3/2. J π : from L(p, α)=2. E(level): possible IAR of 1035, 3/2+ in ^{41}Ar .
9471 15	(1/2-, 3/2-)	I	J π : from L($^3\text{He},d$)=(1).
9626 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
9740.70 10	(3/2)-	IJ	J π : from L($^3\text{He},d$)=1, 8446 γ to 7/2-.
9789 15	(1/2-, 3/2-)	I	J π : from L($^3\text{He},d$)=(1).
9857 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
9936 15	(1/2-, 3/2-)	I	J π : from L($^3\text{He},d$)=(1).
10093 15	1/2-, 3/2-	I	J π : from L($^3\text{He},d$)=1.
10195 15	1/2+ and 1/2-, 3/2-	I	J π , E(level): doublet: 1/2+ and 1/2-, 3/2- from L($^3\text{He},d$)=0+1.
10239 15	(1/2-, 3/2-)	I	J π : from L($^3\text{He},d$)=(1).
12220 50	3/2+, 5/2+	O	T=3/2. J π : from L(p, α)=2. E(level): IAR of 3592, 3/2+, 5/2+ in ^{41}Ar .

Footnotes continued on next page

Adopted Levels, Gammas (continued)
⁴¹K Levels (continued)

† From least-squares fit to E_γ's for levels populated in γ-ray studies. Others are weighted averages of values from different particle reactions.

$\gamma(^{41}\text{K})$						
E(level)	E _γ [†]	I _γ [†]	Mult. [‡]	δ [‡]	α	Comments
980.476	980.461 16	100	M1+E2	0.13 2	6.03×10 ⁻⁵ 9	B(E2)(W.u.)=4.1 19; B(M1)(W.u.)=0.08 3.
1293.609	1293.586 7	100	M2+E3&	+0.118& 12	7.44×10 ⁻⁵ 11	Mult., δ: from B(E2) and T _{1/2} . B(E3)(W.u.)=3.7 8; B(M2)(W.u.)=0.097 3. δ: other: +0.03 +1-2 from ³⁸ Ar(α,pγ).
1559.903	579.418 7	22.0 12	M1+E2	+0.12 4	1.76×10 ⁻⁴ 4	B(E2)(W.u.)=6.9 10; B(M1)(W.u.)=0.053 8. I _γ : weighted average of 21.4 7 (³⁸ Ar(α,pγ)), 19.0 12 (⁴⁰ Ar(p,γ)), 22 4 (⁴⁰ K(n,γ) E=thermal), 24.8 9 (⁴¹ K(p,p'γ),(p,p')).
	1559.89 3	100.0 7	M1+E2	-0.27 2	1.10×10 ⁻⁴	B(E2)(W.u.)=1.07 21; B(M1)(W.u.)=0.0117 16.
1582.001	288.388 6	0.9 3	[E2]		0.00399	B(E2)(W.u.)=27 10.
	601.517 12	18.0 8	E1+M2	-0.06 +9-3	1.05×10 ⁻⁴ 2	B(E1)(W.u.)=4.2×10 ⁻⁵ 3; B(M2)(W.u.)=1.93 12. I _γ : weighted average of 18.8 8 (³⁸ Ar(α,pγ)), 16.8 9 (⁴⁰ Ar(p,γ)), 21 5 (⁴⁰ K(n,γ) E=thermal).
	1581.98 4	100.0 8	E1+M2	-0.08 2	3.43×10 ⁻⁴	B(E1)(W.u.)=1.29×10 ⁻⁵ 6; B(M2)(W.u.)=0.15 8.
1593.107	612.637 8	62 3				I _γ : weighted average of 65.3 18 (³⁸ Ar(α,pγ)), 57.5 20 (⁴⁰ Ar(p,γ)), 80 30 (⁴⁰ K(n,γ) E=thermal).
	1593.4@ 4	100 2				
1677.235	383.617 6	0.72 11	[E1]		3.33×10 ⁻⁴	B(E1)(W.u.)=5.1×10 ⁻⁵ 14.
	1677.23 4	100 1	E2&		1.88×10 ⁻⁴	B(E2)(W.u.)=3.6 8.
1698.005	1697.93 4	100	M1+E2	-2.1 2	1.89×10 ⁻⁴	B(E2)(W.u.)=4.6 12; B(M1)(W.u.)=0.0010 3.
2143.82	445.814 5	4.9 11				
	550.73 3	0.19 6	[E2]		4.24×10 ⁻⁴	B(E2)(W.u.)=7 3.
	561.842 22	0.30 6	[E1]		1.23×10 ⁻⁴	B(E1)(W.u.)=2.8×10 ⁻⁵ 10.
	583.900 15	30 6				
	1162.8 ^{§b} 3	6.3 [§] 14	[E2]		6.01×10 ⁻⁵ 9	B(E2)(W.u.)=5.9 21.
	2143.71 4	100 11	M1+E2	-0.15 6	3.25×10 ⁻⁴	B(E2)(W.u.)=0.10 8; B(M1)(W.u.)=0.0064 19.
2166.70	573.597 9	8.7 20	[E1]		1.17×10 ⁻⁴	B(E1)(W.u.)=6.1×10 ⁻⁵ 18.
	584.685 11	37 8				I _γ : other: 11.5 13 from ⁴⁰ Ar(p,γ).
	606.824 18	4.5 13	[E1]		1.02×10 ⁻⁴	B(E1)(W.u.)=2.7×10 ⁻⁵ 9.
	1186.170 17	100 27	E1+M2	-0.14 +9-18	7.29×10 ⁻⁵ 14	B(E1)(W.u.)=7.7×10 ⁻⁵ 24. Mult.: D+Q from γ(θ) in ³⁸ Ar(α,pγ); Δπ=yes from level scheme.
	2166.72 5	76 3	[E1]		7.66×10 ⁻⁴	B(E1)(W.u.)=9.9×10 ⁻⁶ 17. I _γ : weighted average of 75 3 (⁴⁰ Ar(p,γ)), 82 8 (⁴⁰ K(n,γ) E=thermal).
2316.62	639.345 11	0.28 15	[E1]		8.99×10 ⁻⁵ 13	B(E1)(W.u.)=1.0×10 ⁻⁵ 6.
	734.605 8	6.1 4	M1+E2	-0.14 7	1.08×10 ⁻⁴ 2	B(E2)(W.u.)=0.59 19; B(M1)(W.u.)=0.0053 17. Mult.: D+Q from γ(θ) in ³⁸ Ar(α,pγ); Δπ=no from level scheme.
						I _γ : weighted average of 6.4 3 (³⁸ Ar(α,pγ)), 4.0 10 (⁴⁰ K(n,γ) E=thermal), 5.8 7 (⁴¹ K(p,p'γ),(p,p')).
	1022.996 7	100 22	M1+E2	-0.08 1	5.53×10 ⁻⁵ 8	B(E2)(W.u.)=0.61 24; B(M1)(W.u.)=0.033 13.
	2316.55 20	3.4 7	[E1]		8.63×10 ⁻⁴	B(E1)(W.u.)=2.5×10 ⁻⁶ 10.
2440.18	742.142 13	11.6 24				I _γ : other: 22.9 in ⁴¹ K(p,p'γ),(p,p').

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Adopted Levels, Gammas (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
2440.18	846.967 23 880 [§] 1459 ^a 2440.28 6	7.8 17 9 [§] 3 26 100 10				
2447.83	2447.77 6	100				
2494.91	796.926 20	39.5 21	E2		1.43×10^{-4}	B(E2)(W.u.)<13. I γ : from $^{38}\text{Ar}(\alpha, p\gamma)$. Mult.: Q from $\gamma(\theta)$ in $^{38}\text{Ar}(\alpha, p\gamma)$, $\Delta\pi$ =no from level scheme.
	817.659 9 1201.303 17	100 3 67.1 23	M1+E2 E1+M2	+0.38 2 +0.06 2	9.15×10^{-5} 14 8.14×10^{-5} 12	B(E2)(W.u.)<4; B(M1)(W.u.)<0.005. B(E1)(W.u.)< 3.4×10^{-5} ; B(M2)(W.u.)<0.65. I γ : from $^{38}\text{Ar}(\alpha, p\gamma)$. B(E1)(W.u.)=0.00060 23.
2507.93	191.24 6 364.089 7 830.679 9	0.25 6 6.0 9 83 18	[E1] M1+E2		0.00259 8.8×10^{-5} 8	B(E2)(W.u.)=48 17; B(M1)(W.u.)=0.08 3. Mult.: D+Q from $\gamma(\theta)$ in $^{38}\text{Ar}(\alpha, p\gamma)$, $\Delta\pi$ =no from level scheme.
	948.001 13	16 3	E2		9.05×10^{-5} 13	B(E2)(W.u.)=41 14. Mult.: Q from $\gamma(\theta)$ in $^{38}\text{Ar}(\alpha, p\gamma)$, $\Delta\pi$ =no from level scheme.
	1214.327 22 2507.88 4	21 4 100 10	[E1] E2		8.93×10^{-5} 13 5.73×10^{-4}	B(E1)(W.u.)=0.00020 7. B(E2)(W.u.)=2.0 6.
2527.66	850.417 7	100	E2 ^{&}		1.20×10^{-4}	B(E2)(W.u.)=1.00 3.
2593.97	895.4 ^b	<1				E γ , I γ : from (p, γ). An 895.95 γ shown as the most intense transition from 2593.97 level in (n, γ) is not confirmed in (p, γ), where an upper limit of =1% is suggested.
	1011.89 21 2593.9	100.0 23 13.6 23				E γ , I γ : from $^{40}\text{Ar}(p, \gamma)$.
2676.1	1115.8 ^a 2676.0 ^a	100 ^a 56 ^a				
2710.48	566.650 1117.3 [§] 1729.8 [§]	46 10				
	2710.41 16	100 11				
2712.57	395.945 2	15.9 13	M1+E2	+0.15 8	0.00042 3	B(E2)(W.u.)=30 9; B(M1)(W.u.)=0.068 20. I γ : weighted average of 14.9 6 ($^{38}\text{Ar}(\alpha, p\gamma)$), 19 4 ($^{40}\text{K}(n, \gamma)$) E=thermal, 19.1 11 ($^{41}\text{K}(p, p'\gamma), (p, p')$).
	545.876 7 1014.498 18 1130.76 20	2.2 5 10.3 22 21 4	[E2] [E1] [E2]		4.36×10^{-4} 3.36×10^{-5} 5 6.13×10^{-5} 9	B(E2)(W.u.)=38 14. B(E1)(W.u.)= 7.0×10^{-5} 25. B(E2)(W.u.)=9 4. I γ : weighted average of 35 11 ($^{40}\text{Ar}(p, \gamma)$), 20 3 ($^{40}\text{K}(n, \gamma)$) E=thermal).
	1418.975 15 612.925 8 1058.708 15	100 1 12 3 17 3	M1(+E2)	-0.4 5	7.7×10^{-5} 8	B(E2)(W.u.)=2.0 6; B(M1)(W.u.)=0.0082 23. I γ : other: 26 14 in $^{40}\text{Ar}(p, \gamma)$. I γ : weighted average of 21 5 ($^{40}\text{Ar}(p, \gamma)$), 15 3 ($^{40}\text{K}(n, \gamma)$) E=thermal).
	1079.44 4	5 2				I γ : weighted average of 6.9 17 ($^{40}\text{Ar}(p, \gamma)$), 2.4 6 ($^{40}\text{K}(n, \gamma)$) E=thermal).
	1196.785 17	19 4				I γ : weighted average of 19 5 ($^{40}\text{Ar}(p, \gamma)$), 19 4 ($^{40}\text{K}(n, \gamma)$) E=thermal).
	1463.35 12	26 9				I γ : weighted average of 26 9 ($^{40}\text{K}(n, \gamma)$) E=thermal, 27 9 ($^{41}\text{K}(n, n'\gamma)$).
	2756.68 4	100 5	M1+E2	-32 +17-18	6.86×10^{-4}	B(E2)(W.u.)=4.5 19; B(M1)(W.u.)= 1.1×10^{-5} 5.
2761.73	266.841 19	0.27 9	(E1)		9.46×10^{-4}	B(E1)(W.u.)=0.00017 7.

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Adopted Levels, Gammas (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
2761.73	1468.090 12	100 22	E2&		1.10×10^{-4}	B(E2)(W.u.)=21 7.
2774.25	246.587 3	100	M1(+E2)&	+0.013& 14	1.18×10^{-3}	B(E2)(W.u.)=0.243 8; B(M1)(W.u.)=0.0286 9. δ : other: +0.04 4 from $\gamma(0)$ in $^{38}\text{Ar}(\alpha, p\gamma)$.
3048.22	454.4\$ 904.38 ^{b c} 3 1454.0\$ 1465.0\$ 2067.2\$ 3047.8 3	<16 ^c 22\$ 7 100 7				
3141.84	380.13 7 385.107 7 633.891 8 646.924 4	0.7 3 14 3 100 24 56 13				
3142.43	825.19 3 380.696 ^b 8 614.766 ^b 7	5.3 11 1.9 3 2.6 7				
	998.45 7	1.2 3	[E1]		3.47×10^{-5}	B(E1)(W.u.)= 3.5×10^{-5} 14.
	1465.10 5	34 8	[E1]		2.55×10^{-4}	B(E1)(W.u.)=0.00031 12.
	1848.82 4	100 10	M1+E2	+0.87 35	2.30×10^{-4}	B(E2)(W.u.)=6 3; B(M1)(W.u.)=0.009 4.
3162.2	3162.1 ^a	100 ^a				
3179.8	1619.8\$ 3179.7\$	32\$ 7 100\$ 7				
3213.61	1631.5 ^b 4 1919.95 4	12 3 100 10				I γ : other: 67 20 in $^{41}\text{K}(\text{n}, \text{n}'\gamma)$.
	3213.7 ^b 4	5.9 9	[E1]		1.35×10^{-3}	B(E1)(W.u.)= $7. \times 10^{-6}$ 4.
3229.8	1669.8\$ 2249.2\$ 3229.7\$	100\$ 27 73\$ 18 49\$ 18				
3235.57	918.949 13	45 10				I γ : others: 22 7 in $^{40}\text{Ar}(\text{p}, \gamma)$ and 52 in $^{41}\text{K}(\text{p}, \text{p}'\gamma), (\text{p}, \text{p}')$.
	1941.91 4	100 10				
3240.65	732.714 ^c 6 745.733 13 1096.832 17 1542.19 21 1946.95 4	52 ^c 12 18 4 24 5 6.8 8 100 10				
3277.9	2297.4 ^{a b} 3277.8 ^a	140 ^a 100 ^a				
3431.84	670.112 8 719.272 12 1115.20 3 2138.12 4	38 10 30 6 19 4 100 10				
3450.1	2156.17 6	100				
3488.5	1041.51 ^b 5 1790.5	13 3 9.2 16				I γ : weighted average of 12.2 19 ($^{40}\text{Ar}(\text{p}, \gamma)$), 8.4 10 ($^{40}\text{K}(\text{n}, \gamma)$ E=thermal).
	1895.5\$ 2194.8\$ 2507.9\$ 3488.3	4.1\$ 13 3.8\$ 13 6.6\$ 15 100 8				I γ : other: 30 4 in $^{40}\text{K}(\text{n}, \gamma)$, E=thermal.
3521.38?	1026.48 ^c 6 3520.84 15	18 ^c 5 100 8				
3534.45	293.786 ^c 10 1006.81 3 1026.48 ^c 6 1039.532 12	3.7 ^c 8 72 15 14 ^c 4 100 21				
3560.61	418.80 4 3561.0 5	1.3 4 100 27				
3572.38	1255.71 7 1895.09 4	16 6 100 10				

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Adopted Levels, Gammas (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
3578.3	1880.6# 6 1900.0# 9 2018.3# 4	100# 19 98# 23 58# 8				
3579.2	1435.5\$ 2019.2\$					$E\gamma$: this γ may correspond to 2018.3 γ from 3578.3 level.
3612.77	3579.0\$ 2019.61\$ 2030.51 20	29\$ 7 48 5				$E\gamma$: from (p, γ) only. $I\gamma$: weighted average of 53 9 ($^{40}\text{Ar}(\text{p},\gamma)$), 46 5 ($^{40}\text{K}(\text{n},\gamma)$ E=thermal).
3626.1	3612.91 11 2043.9\$	100 5 100				
3651.46	1974.22 4 2358.46 23	100 10 22 3				
3740.1	2157.9\$ 3739.9\$	100\$ 20 100\$ 20				
3761.54	1004.87 3 1266.45 ^{b,c} 22 2063.5\$	5.4 11 8.3 ^c 18 10\$ 3				$I\gamma$: other: 7 3 in $^{40}\text{Ar}(\text{p},\gamma)$. $E\gamma$: from (p, γ). A 2062.7 γ in (n, γ) is placed from 4229 level and a a 2061.2 γ is unplaced in (n,n' γ). $I\gamma$: other: 24 6 in $^{40}\text{Ar}(\text{p},\gamma)$.
3774.66	2201.53 ^c 9 3761.21 7 539.09 3 561.05 4 1266.45 ^{b,c} 22 2192.21 12	15.4 ^c 18 100 5 2.9 6 1.8 5 23 ^c 5 40 7				$I\gamma$: weighted average of 27 9 ($^{40}\text{Ar}(\text{p},\gamma)$), 44 5 ($^{40}\text{K}(\text{n},\gamma)$ E=thermal).
	2480.92 5 2794.04 ^b 20 3774.74 12	100 10 41 11 90 13				$I\gamma$: weighted average of 55 18 ($^{40}\text{Ar}(\text{p},\gamma)$), 95 6 ($^{40}\text{K}(\text{n},\gamma)$ E=thermal).
3826.90	586.26 4 685.056 ^c 8 2128.6 3 2149.73 5 3826.55 15	2.1 9 19 ^c 5 28 3 100 10 93 7				
3861.3	2301.3\$ 2880.7\$ 3861.1\$	82\$ 8 14\$ 4 100\$ 8				
3870.52	1727.24 ^c 24 2576.48 ^c 25	100 ^c 12 87 ^c 11				
3897.0	1123.17 20	100	D(+Q)&	<+0.02&		$E\gamma$: from $^{26}\text{Mg}(^{18}\text{O},\text{p}2\text{n}\gamma)$, $^{27}\text{Al}(^{16}\text{O},2\text{p}\gamma)$.
3911.7	2931.1\$ 3911.5\$	100\$ 8 25\$ 8				
3990.40?	429.790 10 1228.59 5	54 10 100 21				
3996.49	344.79 8 854.043 20 854.642 20 1488.54 4 2298.55 12 2319.27 5 2436.61 9 2702.64 7 3015.8 4 3996.25 6	59 9 100 28 0.15 6 14 3 18 2 55 6 39 4 20 2 5.3 10 100 5				
4026.7	1709.9\$ 2732.9\$	66\$ 12 100\$ 12				
4026.94	2466.90 ^b 7	100				

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Adopted Levels, Gammas (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
4146.15	371.51 6	5.8 10				
	2852.25 17	100 12				
4164.57	403.03 3	1.2 3				
	732.714 ^c 6	33 ^c 8				
	1716.2 5	2.1 5				
	2466.6 [§]	33 [§] 11				
	2487.27 4	100 10				
4220.62	193.73 11	0.5 3				
	607.846 ^c 9	15 ^c 4				
	659.92 ^c 9	4.3 ^c 10				
	2521.84 ^c 24	19 ^c 2				
	2543.49 19	36 4				
	2926.96 6	100 10				
	4220.63 12	43 3				
4228.99	358.465 13	15 4				
	402.08 3	1.9 5				
	988.47 6	6.8 15				
	993.21 8	3.8 9				
	1721.02 4	53 5				
	2062.7 3	21 2				
	2935.07 5	100 10				
	4228.8 3	11.4 15				
4244.22	592.777 25	1.0 3				
	1101.71 3	9.2 20				
	1649.96 ^c 14	9.6 ^c 18				
	2077.55 12	17 2				
	2950.55 5	100 10				
4260.36	1666.51 15	14 2				
	2562.55 11	100 10				
	4259.73 11	52 3				
4274.2	1500.14 20	24.2 13	E1(+M2)&	-0.06& 12	2.80×10 ⁻⁴ 7	B(E1)(W.u.)=3.2×10 ⁻⁴ 19; B(M2)(W.u.)=2.4 14. E γ ,I γ : from $^{26}\text{Mg}(^{18}\text{O},\text{p}2\text{n}\gamma),^{27}\text{Al}(^{16}\text{O},2\text{p}\gamma)$.
	1512.79 15	100.0 13	E2&		1.24×10 ⁻⁴	B(E2)(W.u.)=70 50. E γ ,I γ : from $^{26}\text{Mg}(^{18}\text{O},\text{p}2\text{n}\gamma),^{27}\text{Al}(^{16}\text{O},2\text{p}\gamma)$.
4274.96	740.51 4	1.3 4				
	1513.31 8	15.5 16				
	2576.48 ^c 25	4.2 ^c 5				
	2981.26 5	100 10				
4303.01	768.531 19	18 5				
	1808.7 ^c 3	14 ^c 6				
	1986.36 ^c 23	18 ^c 2				
	2605.08 7	100 10				
	4302.7 3	22 3				
4340.9	4340.7 [§]	100 [§]				
4345.66	694.199 10	17 4				
	1110.083 14	66 13				
	1203.21 5	14 4				
	2201.53 ^c 9	22 ^c 2				
	2647.83 ^c 25	9.6 ^c 11				
	2668.55 10	100 10				
	2763.40 6	49 5				
	3051.7 3	31 4				
4459.72	685.056 ^c 8	10.6 ^c 25				
	846.967 23	8.5 19				
	2899.77 6	100 10				
	3479.8 3	24 3				
	4459.0 6	75 4				
4525.37	296.340 23	4.9 12				
	304.76 4	3.7 12				
	2381.1 4	100 16				
4568.75	293.786 ^c 10	6.1 ^c 13				
	1794.6 9	53 5				

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Adopted Levels, Gammas (continued)

 $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡	α	Comments
4568.75	2041.02 7	100 10			
4609.48	1368.47 12	14 4			
	1852.85 6	48 5			
	2114.10 25	100 10			
4674	4674 §	100 §			
4730.70	1588.68 11	30 3			
	3437.10 12	100 7			
4735.86	2240.95 7	100 10			
	2419.03 8	70 7			
	3038.4 3	47 6			
	4735.9 3	11.2 13			
4745.49	2250.38 b 15	35 4			
	2428.92 18	38 4			
	3067.79 b 20	60 6			
	3163.67 10	100 6			
	4744.6 6	71 4			
4749.47	974.67 7	10 2			
	3455.86 9	100 6			
	4749.05 11	64 4			
4823.33	548.365 10	8 2			
	2066.1 4	14 2			
	2295.9 3	39 5			
	2315.33 20	100 16			
	2328.34 15	31 3			
	2375.7 3	16 2			
	3124.5 7	10 3			
	3146.19 13	87 6			
	3529.4 4	29 5			
4848.5	2704.6 §	61 § 16			
	4848.2 §	100 § 16			
4862.43	2268.13 19	67 8			
	3185.2 3	95 12			
	4862.43 10	100 6			
4927.83	2171.01 6	100 10			
	2215.33 21	33 4			
	2611.15 12	70 7			
	3229.6 5	93 23			
	3253.1 9	66 34			
	3334.6 3	36 4			
	3634.1 3	15 2			
4948.94	339.41 4	2.3 6			
	3366.78 13	100 7			
	3655.0 3	67 8			
4962.3	4962.0 §	100 §			
4982.9	708.31 10	100	E2&	1.99×10^{-4}	B(E2)(W.u.)=5.35 16. E γ : from $^{26}\text{Mg}(^{18}\text{O}, \text{p}2\text{n}\gamma), ^{27}\text{Al}(^{16}\text{O}, 2\text{p}\gamma)$.
5021.23?	4041.0 6	41 10			
	5021.19 17	100 7			
5096.20	1321.33 9	46 12			
	2383.4 4	96 15			
	2588.3 5	100 19			
	2647.83 c 25	61 c 7			
5101.2	2784.3 §	100 § 27			
	5100.9 §	82 § 27			
5129.4?	2813.1 $^{\#b}$ 6	100 $^{\#}$ 14			
	3835.6 $^{\#}$ 11	26 $^{\#}$ 7			
5185.27	361.99 3	2.6 5			
	454.557 7	5.2 12			
	659.92 c 9	5.9 c 14			
	1624.76 16	27 3			
	1753.64 18	21 2			
	2677.27 10	100 10			
5298.86	568.170 17	34 7			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$
5298.86	773.471 19	38 11	5912.50	3416.8 3	55 6
	1808.7 ^c 3	22 ^c 9	5952.41	2809.9 4	30 4
	1867.45 ^c 25	24 ^c 3		3191.2 3	100 11
	2850.2 4	100 20	5968.89	1804.7 3	16 4
	3155.0 3	53 8		3194.8 6	60 16
	3715.9 ^c 4	33 ^c 5		3206.7 3	100 11
5401.7	3084.8 ^s	19 ^s 6	6040.67	2278.5 6	16 3
	5401.3 ^s	100 ^s 6		2805.21 13	100 10
5496.61	887.13 ^c 5	5.3 ^c 16		2827.06 24	47 6
	1499.78 13	19 4		3282.8 5	68 16
	2784.08 17	20 2		3723.9 3	41 5
	2968.61 ^c 18	16 ^c 2	6070.76	1247.40 4	100 21
	2988.2 10	2.6 6		2458.5 3	38 4
	3001.4 3	10.1 12		4372.6 ^c 5	45 ^c 5
	3179.67 10	49 3		4776.65 22	46 4
	5495.88 ^b 8	100 5	6078.56	419.31 ^c 3	3.7 ^c 10
5548.19	620.34 3	2.1 5		1857.90 10	100 10
	1557.67 18	37 4		2838.1 3	63 7
	2405.64 21	21 2		4380.2 10	32 6
	3870.84 11	65 4		4496.0 4	35 5
	5547.91 12	100 6	6186.04	887.13 ^c 5	11 ^c 3
5557.39	258.53 5	7.5 15		2158.93 8	86 9
	1529.97 25	29 4		2945.08 12	52 5
	2963.0 4	43 7		3042.81 20	100 8
	4576.65 11	100 6		4509.6 3	23 3
5575.24?	712.800 ^c 17	8 ^c 2	6211.50	3683.71 7	100 6
	2862.57 15	100 11		3715.9 ^c 4	10.5 ^c 17
	5573.9 3	42 5		3895.0 4	8.6 12
5604.58	419.31 ^c 3	2.7 ^c 8	6229.88?	1770.55 ^c 22	22 ^c 2
	655.60 3	4.2 11		2083.64 7	100 10
	742.142 13	38 8		3086.7 7	28 9
	1953.0 3	39 5	6255.96	645.17 6	5.5 11
	5604.26 18	100 7		2011.7 9	82 9
5610.83	880.14 3	76 15		3747.9 ^c 6	35 ^c 7
	3932.7 5	100 18		4673.52 11	100 6
	5610.3 5	82 12	6290.05	2046.31 16	60 6
5655.66	2414.92 7	59 6		4696.38 ^c 17	100 ^c 7
	2513.88 12	30 3		4705.8 8	20 5
	3488.59 21	100 12		5309.3 5	19 3
	4063.0 3	17 2		6289.24 21	97 8
5659.25	1356.0 3	20 5	6394.31	2567.4 4	34 4
	4099.69 24	33 3		2619.41 19	76 8
	5658.9 15	100 7		2833.7 3	49 6
5800.80	1051.27 4	22 5		4227.4 3	32 5
	1064.926 ^c 20	100 ^c 22		4696.38 ^c 17	100 ^c 7
	2026.4 3	31 9	6434.51	607.846 ^c 9	23 ^c 6
	3292.64 19	93 9		2089.12 24	22 3
	4820.08 18	58 4		3385.88 10	100 6
5826.66	1090.74 5	31 7		4117.87 8	84 5
	1606.05 ^c 8	52 ^c 5	6450.15?	623.486 14	14 4
	2304.83 17	37 4		1840.93 15	32 4
	2590.6 7	35 9		2688.19 12	100 12
	4532.7 3	100 12		6450.6 4	20 2
5886.95	1156.32 12	54 16	6497.00	5203.2 3	100
	2059.8 3	47 6	6528.13	2531.48 12	66 7
	3129.59 15	100 9		2875.7 3	18.2 22
	4905.3 9	58 17		3815.21 10	100 6
5912.50	891.260 20	18 4	6769.77	1470.99 17	84 39
	1747.88 16	22 2		3627.74 14	100 7
	2671.1 4	51 7		4175.64 23	43 4
	3138.25 14	56 5		5476.0 ^c 3	56 ^c 7
	3150.6 3	50 6	6782.54	1286.03 10	100 28
	3404.78 15	100 7		2521.84 ^c 24	66 ^c 8

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
 $\gamma(^{41}\text{K})$ (continued)

E(level)	E $\gamma^\dagger$	I $\gamma^\dagger$	E(level)	E $\gamma^\dagger$	I $\gamma^\dagger$
6782.54	3540.8 9	59 24	7361.15?	5776.8 10	34 11
	4465.7 4	38 5	7593.06	1064.926 ^c 20	92 ^c 20
6791.36	712.800 ^c 17	18 ^c 4		3317.59 22	100 9
	904.38 ^c 3	32 ^c 7		4880.8 6	8.7 16
	1606.05 ^c 8	100 ^c 10	7654.93	2106.50 19	30 3
	1770.55 ^c 22	37 ^c 4		2355.9 6	25 5
	4474.0 7	16 4		2727.07 18	47 5
	5114.5 4	79 9		2919.06 13	68 7
6835.43	338.47 6	1.2 6		3379.76 12	82 5
	1649.96 ^c 14	48 ^c 5		3410.75 21	77 7
	1739.14 7	82 9		5510.82 15	100 6
	2559.9 3	57 8	7938.98	1727.24 ^c 24	40 ^c 5
	3693.2 3	35 5		1867.45 ^c 25	23 ^c 3
	4668.25 ^c 24	30 ^c 3		1986.36 ^c 23	26 ^c 3
	5157.8 7	26 5		3792.6 3	66 8
	5541.64 17	100 7		5225.9 4	38 6
6995.53	2692.14 22	91 10		6644.90 15	100 7
	2968.61 ^c 18	100 ^c 11	8190.21	2534.4 4	100 13
	4238.51 20	76 6		3944.8 5	88 14
	5319.5 9	13 4		4429.0 5	40 6
7020.97	492.821 23	1.1 3		4668.25 ^c 24	61 ^c 6
	3024.88 21	39 4		4701.3 5	90 10
	3785.6 3	100 29	8200.11	1909.74 14	98 10
	5727.03 22	95 8		2121.40 25	36 4
7035.28	2211.93 19	41 4		3740.45 23	87 9
	3421.2 5	30 5		3939.9 3	85 9
	4322.00 18	28 2		4372.6 ^c 5	37 ^c 4
	4891.12 14	23 2		4639.50 19	30 2
	5357.7 3	100 10		5151.7 3	100 9
	5476.0 ^c 3	27 ^c 3		6522.4 6	10 2
7361.15?	1534.2 5	10.3 17	9740.70	6308.8 8	100 24
	2433.16 21	100 11		7028.03 25	90 8
	2615.48 25	68 7		8445.5 7	18 4
	3747.9 ^c 6	33 ^c 7			
	4647.89 17	36 3			

[†] From ⁴⁰K(n, γ), E=thermal, except where noted.

[‡] From ³⁸Ar(α ,p γ), except where noted.

[§] From ⁴⁰Ar(p, γ).

From ⁴¹K(n,n' γ).

@ From ³⁸Ar(α ,p γ).

& From $\gamma(\theta, \text{lin pol})$ in ²⁶Mg(¹⁸O,p2n γ), ²⁷Al(¹⁶O,2p γ).

a From ⁴¹K(p,p' γ), (p,p').

b Placement of transition in the level scheme is uncertain.

c Multiply placed; undivided intensity given.

⁴¹Ar β^- Decay (109.61 min) 1971Ju04,1968Wh03,1956Sc91

Parent ⁴¹Ar: E=0; J π =7/2-; T_{1/2}=109.61 min 4; Q(g.s.)=2492.0 3; % β^- decay=100.

1971Ju04: ⁴¹Ar activity from the ⁴⁰Ar(d,p) reaction with E(d)=3-4 MeV. Measured E γ , I γ using Ge(Li) detector.

1968Wh03: ⁴¹Ar activity from irradiation of Ar gas in reactor. Precise measurement of E γ of 1293.6 γ using Ge(Li) detector.

1956Sc91: ⁴¹Ar activity from irradiation of Ar gas in reactor. Measured E γ , I γ using NaI(Tl) scintillator and E β , I β using a 180° and lens-type magnetic β spectrometer.

T_{1/2} and isotopic assignment: 2014Bh09, 1990Ab06, 1986Ru09, 1984Ke14, 1971Ju04, 1969Bo11, 1964Pa03, 1956Sc91, 1954An25, 1952Ka44, 1951Ha78, 1946Bl28, 1937Hu01, 1936Sn01.

β , shape factors: 2015Mo10, 1964Pa03, 1961Ka19, 1956Sc91, 1950Br29, 1946Bl28. 1972Ma72 (calculation of average E β).

γ : 2014Bh09, 1984Ke14, 1971Ju04, 1968Wh03 (also 1967Wh01), 1967Sm03, 1965Ma09, 1965Pr05, 1961Ka19, 1956Sc91, 1955Kl30.

ce: 1961Ka19.

γ/γ measurement: 1962Al11.

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^{41}Ar β^- Decay (109.61 min) 1971Ju04,1968Wh03,1956Sc91 (continued) $\beta\gamma$, $\beta\gamma(t)$: 1953En06, 1952El27, 1946Bl28. $\beta\gamma(\theta)$: 1960Bo02, 1966Dy02. $\beta\gamma(\text{circ pol}, \theta)$: 1972Lo18, 1969Lo05, 1967Be20, 1962Ch17, 1962Bl02, 1960Bl08, 1960Ma02, 1960Bl01. 1972De59 (theory).Fermi-matrix element and $\beta\gamma(\text{circ pol})$ data compiled and analyzed: 1965Da03.

Analysis of first-forbidden unique transitions: 1985To18, 1972Ma72, 1971To08.

Source calibration techniques: 1996Yo12.

Fermi matrix element versus size parameter calculations: 1992Ya06.

 ^{41}K Levels

E(level) [†]	J $\pi^{\ddagger}$	T _{1/2}	Comments
0.0	3/2+		
1293.64 4	7/2-	6.7 ns 5	T _{1/2} : from $\beta\gamma(t)$ (1952El27). Other: 6.6 ns (1953En06).
1677.0 3	7/2+		

[†] From E γ .[‡] From the Adopted Levels. **β^- radiations**

E β^-	E(level)	I β^- ^{†‡}	Log ft	Comments
(815.0 5)	1677.0	0.052 5	7.68 5	
(1198.4 3)	1293.64	99.16 2	5.0477 5	E β^- : others: 1198.3 11 (1964Pa03), 1195 8 (1961Ka19), 1199 8 (1956Sc91), 1245 5 (1950Br29). Allowed shape (1956Sc91, 1961Ka19, 1964Pa03).
(2492.0 3)	0.0	0.78 2	9.726 ^{1u} 12	I β^- : from 1961Ka19. Other: 0.88 (1956Sc91), 0.7 (1946Bl28). E β^- : others: 2489 3 (1964Pa03), 2485 10 (1961Ka19), 2480 40 (1956Sc91), 2550 (1946Bl28). Unique first-forbidden shape (1956Sc91).

[†] From the yield of expected γ rays within 2 σ 's, 1971Ju04 deduce following upper limits for some of the other levels: <0.025 for 980 level, <0.0038 for 1560 level, <0.0040 for 1582 level, <0.0058 for 1594 level, <0.0030 for 1698 level, <0.0054 for 2144 level and <0.012 for 2166 level.[‡] Absolute intensity per 100 decays. **$\gamma(^{41}\text{K})$** I($\gamma\gamma$)/I γ <6 $\times 10^{-5}$ (1962Al11).I γ normalization: from I γ (1293 γ +1677 γ)=99.22 2, using %I β (to g.s.)=0.78 2 (1961Ka19).

E $\gamma^{\dagger}$	E(level)	I $\gamma^{\dagger\ddagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
1293.64 4	1293.64	100	M2+E3	+0.118 12	6.8 $\times 10^{-5}$ 9	E γ : from 1968Wh03. Others: 1293.76 14 (1967Wh01), 1294.35 30 (1967Sm03). α : from 1961Ka19.
1677.0 3	1677.0	0.052 5	E2		1.88 $\times 10^{-4}$	I γ : other: 0.05 2 (1965Pr05).

[†] From 1971Ju04, except where noted.[‡] From the Adopted Levels.[§] For absolute intensity per 100 decays, multiply by 0.9916 2.

^{41}Ar β^- Decay (109.61 min) 1971Ju04,1968Wh03,1956Sc91 (continued)

 ^{41}Ca ϵ Decay (9.94×10^4 y) 2012Jo04,1991Pa10,1991Kl06

Parent ^{41}Ca : $E=0$; $J\pi=7/2^-$; $T_{1/2}=9.94 \times 10^4$ y 15; $Q(g.s.)=421.66$ 14; $\% \epsilon$ decay=100.

2012Jo04: measured $T_{1/2}$ by liquid scintillation counting and thermal ionization mass spectrometry.

1991Pa10 (also 1989Ku33): measured $T_{1/2}$ by mass spectrometry, K x ray, internal bremsstrahlung.

1991Kl06 (also 1990Fi13): measured $T_{1/2}$ by mass spectrometry.

1989Ku33: measured x-ray spectra.

1987Ho16: measured K x ray, (K x ray)(IB) coin, IB(internal bremsstrahlung).

1974Ma30, 1972Em01, 1962Dr03, 1953Br71 (also 1951Br94,1950Ri59), 1951Sa31: measured $T_{1/2}$ by activation method. These values depend upon $\sigma(n\text{-capture})$ and K x ray fluorescence yields.

K x ray: 1970Si24, 1951Sa31.

Internal bremsstrahlung: 1973My03.

Internal ionization: 1988Ja11.

Source standardization: 1996Ro15.

 ^{41}K Levels

E(level)	$J\pi^\dagger$
0.0	3/2+

† From the Adopted Levels.

 β^+, ϵ Data

$E\epsilon$	E(level)	$I\epsilon^\dagger$	Log ft	$I(\epsilon+\beta^+)^\dagger$
(421.66 14)	0.0	100	10.520 ^{1u} 7	100

† Absolute intensity per 100 decays.

 $^2\text{H}(^{40}\text{Ar}, n\gamma)$ 1977Sc11

$E(^{40}\text{Ar})=56$ MeV. Measured $E\gamma$, $I\gamma$ using a 50 cm³ coaxial Ge(Li) detector; deduced $T_{1/2}$ using Doppler Shift Attenuation method (DSAM).

 ^{41}K Levels

E(level) †	$J\pi^\ddagger$	$T_{1/2}^\S$
0.0	3/2+	
980.3 6	1/2+	0.35 ps 14

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$^2\text{H}(^{40}\text{Ar}, n\gamma)$ 1977Sc11 (continued) ^{41}K Levels (continued)

E(level) [†]	J π [‡]	T _{1/2} [§]	E(level) [†]	J π [‡]	T _{1/2} [§]
1293.6 5	7/2-	>3.5 ps	2165.8 10	3/2-	>2.1 ps
1560.0 6	3/2+	0.42 ps +20-14	2316.4 10	5/2-	
1581.9 6	3/2-	>2.1 ps	2448.8 12	(3/2+, 5/2, 7/2+)	
1593.1 10	1/2+		2761.3 20	11/2-	
1677.4 6	7/2+	>2.8 ps	3142.3 20	5/2-	
1698.2 6	5/2+	0.07 ps +14-7	3214.0 20	5/2-	
2144.2 12	5/2+	0.55 ps +21-14			

[†] From 1977Sc11 which provide the excitation energies derived from transitions observed with sufficient intensity.

[‡] From the Adopted Levels. 1977Sc11 give J π values taken from the literature.

[§] From DSAM measurements. Since stopping powers were not well determined, three different backing materials were used and their resulting lifetimes averaged.

 $\gamma(^{41}\text{K})$

E γ [†]	E(level)	E γ [†]	E(level)	E γ [†]	E(level)
579.7	1560.0	1293.6	1293.6	1848.7	3142.3
584.2	2144.2	1467.7	2761.3	1920.4	3214.0
601.6	1581.9	1560.0	1560.0	2144.1	2144.2
612.8	1593.1	1581.9	1581.9	2165.7	2165.8
765.2 [‡]	3214.0	1593.1	1593.1	2448.7	2448.8
980.3	980.3	1677.4	1677.4		
1022.8	2316.4	1698.2	1698.2		

[†] From level-energy differences using E(level) values given in 1977Sc11.

[‡] Very weak transition shown in γ -ray spectrum of 1977Sc11.

Level Scheme

²⁶Mg(¹⁸O,p2nγ), ²⁷Al(¹⁶O,2pγ) 1978Eg01, 1975O101, 1974Li07

Includes ²⁷Al(¹⁹F,αpγ) and ²⁸Si(¹⁹F,α2pγ) from 1975O101 and ²⁴Mg(²⁴Mg,α3p) from 2008Sa04.
 1978Eg01: ²⁶Mg(¹⁸O,p2nγ) with E(¹⁸O)=34 MeV. Measured Eγ, Iγ, γγ using a Compton-suppression spectrometer in conjunction with two Ge(Li) detector, γ(θ) using a Ge(Li) detector and γ(lin pol) with a three crystal Ge(Li) Compton-polarimeter.
 1975O101: ²⁶Mg(¹⁸O,p2nγ) with E(¹⁸O)=40 MeV. Measured Eγ, Iγ, γ(θ), γ(lin pol) using a Compton polarimeter consisting of two coaxial Ge(Li) detectors. Includes ²⁷Al(¹⁹F,αpγ) at E=40 MeV and ²⁸Si(¹⁹F,α2pγ) at E=45 MeV.
 1974Li07: ²⁷Al(¹⁶O,2pγ) with E(¹⁶O)=32.5–44 MeV. Measured Eγ, Iγ, γγ using two Ge(Li) detectors; deduced lifetimes by Recoil-distance method (RDM).
 1981Le19: ²⁶Mg(¹⁸O,p2nγ) with E(¹⁸O)=36 MeV. Measured g factors by time dependent recoil into gas method and lifetimes using RDM for 2528–, 2774–, and 4983-keV levels.
 1978C109: ²⁷Al(¹⁶O,2pγ) with E(¹⁶O)=34 MeV. Measured Eγ, Iγ using two Ge(Li) detectors; deduced lifetimes using RDM and plunger method.
 1976Me09: ²⁷Al(¹⁶O,2pγ) with E(¹⁶O)=34 MeV. Measured Eγ using two Ge(Li) detectors; deduced lifetimes using RDM and plunger method.
 1976Ra05: ²⁷Al(¹⁶O,2pγ) with E(¹⁶O)=32.5 MeV. Measured Eγ, Iγ, γ(θ,t) deduced lifetimes of 2774– and 4983-keV levels by RDM.
 1973Go31: ²⁷Al(¹⁶O,2pγ) with E(¹⁶O)=20–60 MeV. Measured Eγ, Iγ, excitation function, γγ using two Ge(Li) detectors; deduced lifetimes by RDM.
 Others: 1975Bo44: ²⁷Al(¹⁶O,2pγ), with E(¹⁶O)=30–35 MeV. Measured γ(θ,H), deduced hyperfine field parameters; 2011Ch54: ²⁷Al(¹⁶O,2pγ), with E(¹⁶O)=34 MeV. Measured Eγ, Iγ, integrated polarizational-directional correlation from oriented nuclei. Results of 2011Ch54 consistent with prior measurements. 2008Sa04: ²⁴Mg(²⁴Mg,α3pγ) with E(²⁴Mg)=45.7 MeV. Measured Eγ, reported observation of 247γ, 708γ, 850γ, 1123γ, 1500γ, 1677γ.

⁴¹K Levels

E(level) [†]	Jπ [‡]	T _{1/2} [§]	Comments
0.0	3/2+		
1293.66 4	7/2–	8.1 ns 11	g=+1.29 3 (1975Bo44). T _{1/2} : from RDM (1974Li07). Other: >3.5 ps (1976Me09).
1677.27 17	7/2+	5.4 ps 22	T _{1/2} : weighted average of 9.5 ps 40 (1973Go31) and 4.2 ps 21 (1976Me09). Other: <35 ps (1974Li07).
2527.71 18	11/2+	151 ps 4	g=0.82 19 (1981Le19). T _{1/2} : weighted average of 152.5 ps 35 (1981Le19), 159 ps 10 (1976Me09), 138 ps 7 (1973Go31), 159 ps 8 (1974Li07).
2761.78 14	11/2–	0.48 ps 6	T _{1/2} : from 1978C109. Others: 0.76 ps 55 (1976Me09), 0.90 ps +76–42 (1974Li07).
2774.23 18	13/2+	51.3 ps 16	g=0.46 7 (1981Le19). T _{1/2} : weighted average of 55.5 ps 14 (1981Le19), 53.0 ps 15 (1978C109), 47 ps 3 (1976Me09), 50.3 ps 24 (1976Ra05), 51 ps 6 (1974Li07), 47.0 ps 14 (1973Go31).
3897.4 3	(11/2, 15/2)	>0.14 ps	Jπ: ΔJ=1 γ to 13/2+. T _{1/2} : from 1973Go31.
4274.53 18	15/2–	<0.14 ps	T _{1/2} : from 1978C109. Others: <1.4 ps (1974Li07), 0.62 ps 55 (1976Me09).
4982.85 20	19/2–	70.7 ps 21	g=0.74 30 (1981Le19). g: other: =0.33 (1976Ra05). T _{1/2} : weighted average of 73.5 ps 21 (1981Le19), 67.2 ps 21 (1978C109), 66 ps 10 (1976Me09), 74 ps 6 (1976Ra05), 70 ps 5 (1974Li07), 97 ps 14 (1973Go31).

[†] From a least-squares fit to Eγ, by evaluators.

[‡] From the Adopted Levels.

[§] From RDDS measurements, 1976Ra05 deduce that correction due to hyperfine deorientation during recoil in vacuum is at most 5%.

γ(⁴¹K)

Eγ [†]	E(level)	Iγ [‡]	Mult.#	δ [#]	Iγ' [§]	Comments
246.51 7	2774.23	60.3 18	M1 (+E2)	+0.013 14	115 6	δ: other: –0.01 4 (1975O101). Mult.: A ₂ =–0.210 6, A ₄ =0, POL=–0.32 3 (1978Eg01). Mult.: other: D from A ₂ =–0.267 6 (1973Go31), M1 from A ₂ =–0.28 1, POL=–0.34 7 (1975O101).
708.31 10	4982.85	26.3 8	E2		21 3	Mult.: A ₂ =+0.364 9, A ₄ =–0.091 11, POL=+0.60 6 (1978Eg01). Mult.: other: Q from A ₂ =0.290 10, A ₄ =–0.123 11 (1973Go31), E2 from A ₂ =0.29 1, A ₄ =–0.12 1, POL=0.41 7 (1975O101), Δ _{IPDCO} =+0.12 3 (2011Ch54).

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²⁶Mg(¹⁸O,p2nγ), ²⁷Al(¹⁶O,2pγ) 1978Eg01,1975Ol01,1974Li07 (continued)

γ(⁴¹K) (continued)

Eγ [†]	E(level)	Iγ [‡]	Mult.#	δ [#]	Iγ [§]	Comments
850.40 10	2527.71	81 3	E2		118 6	Mult.: A ₂ =+0.354 10, A ₄ =-0.080 10, POL=+0.51 5 (1978Eg01). Mult.: other: Q from A ₂ =0.279 8, A ₄ =-0.088 8 (1973Go31), E2 from A ₂ =0.28 1, A ₄ =-0.09 1, POL=0.50 8 (1975Ol01), Δ _{IPDCO} =+0.094 12 (2011Ch54).
1123.17 20	3897.4		D(+Q)	<+0.02		Iγ: mixed with a line from background (1978Eg01). Mult.: A ₂ =-0.17 4, A ₄ =0, POL=-0.19 25 (1975Ol01). Mult.: other: D from A ₂ =-0.20 4 (1973Go31).
1293.64 4	1293.66	100 3	M2+E3	+0.118 12	100 6	δ: other: -0.08 10 (1975Ol01). Mult.: A ₂ =+0.387 12, A ₄ =-0.080 14, POL=-0.46 4 (1978Eg01). Mult.: other: Q from A ₂ =0.265 10, A ₄ =-0.088 10 (1973Go31), M2(+E3) from A ₂ =0.25 2, A ₄ =-0.09 2, POL=-0.44 8 (1975Ol01), Δ _{IPDCO} =-0.06 3 (2011Ch54).
1468.17 15	2761.78	46.6 14	E2		36 3	Mult.: A ₂ =+0.248 11, A ₄ =-0.067 12, POL=+0.46 7 (1978Eg01). Mult.: other: Q from A ₂ =0.195 12, A ₄ =-0.089 12 (1973Go31), E2 from A ₂ =0.20 2, A ₄ =-0.10 2, POL=0.51 9 (1975Ol01), Δ _{IPDCO} =+0.079 24 (2011Ch54).
1500.14 20	4274.53	6.7 4	E1(+M2)	-0.06 12	8 1	Mult.: A ₂ =-0.35 8, A ₄ =0, POL=+0.7 3 (1978Eg01). Mult.: other: D from A ₂ =-0.37 3 (1973Go31), E1 from A ₂ =-0.37 3, POL=0.47 32 (1975Ol01), Δ _{IPDCO} =+0.05 3 (2011Ch54).
1512.79 15	4274.53	27.4 9	E2		22 3	Mult.: A ₂ =+0.330 20, A ₄ =-0.15 3, POL=+0.59 12 (1978Eg01). Mult.: other: Q from A ₂ =0.227 20, A ₄ =-0.056 23 (1973Go31), E2 from A ₂ =0.23 2, A ₄ =-0.08 2, POL=0.46 16 (1975Ol01), Δ _{IPDCO} =+0.04 3 (2011Ch54).
1677.1 2	1677.27		E2		112	Iγ: Iγ(1513γ):Iγ(1500γ)=80 3:20 3 (1973Go31), 80.5 11:19.5 11 (1978Eg01). Iγ: mixed with a line from ³² P (1978Eg01). δ(M3/E2)=0 from A ₂ =+0.20 2, A ₄ =-0.07 2, POL=+0.17 6 (1975Ol01). Mult.: other: Q from A ₂ =0.215 10, A ₄ =-0.063 11 (1973Go31), E2 from A ₂ =0.20 2, A ₄ =-0.07 2, POL=0.17 6 (1975Ol01), Δ _{IPDCO} =+0.052 13 (2011Ch54).

[†] From (¹⁸O,p2nγ). Weighted averages of 1978Eg01 and 1973Go31. Eγ=1293.64 4 was used for calibration.

[‡] From 1978Eg01 at E(¹⁸O)=34 MeV.

[§] From (¹⁶O,2pγ) (1974Li07). Values given by authors were given relative to Iγ(1677γ)=100 have been renormalized by evaluators to Iγ(1294γ)=100.

[#] From γ(θ) and γ(lin pol) in 1978Eg01, except where noted.

³⁷Cl(α,γ): 4013 Resonance 1981BuZY

1981BuZY (also thesis by Burman): E(α(lab))=3817 5 and 4013 5. Measured lifetimes by DSAM. See also ³⁷Cl(α,γ): 3871 Resonance.

All data are taken from thesis by 1981BuZY.

⁴¹K Levels

E(level)	Jπ [†]	T _{1/2} [‡]	Comments
0.0	3/2+		
980	1/2+	>2.1 ps	
1293	7/2-	>1.4 ps	
1559	3/2+	0.59 ps 17	
1582	3/2-	>1.4 ps	
1594	1/2+	0.30 ps 9	
1677	7/2+	2.7 ps 17	

Continued on next page (footnotes at end of table)

$^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance 1981BuZY (continued) ^{41}K Levels (continued)

E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$	Comments
1697	5/2+	0.83 ps 28	
2143	5/2+	0.25 ps 7	
2167	3/2-	1.5 ps 7	
2317	5/2-	0.18 ps 10	
2440§		0.15 ps# 3	
2495	9/2+	1.7 ps 10	
2508	7/2+	0.29 ps 6	
2594§	1/2-, 3/2-	0.19 ps# 8	
2600?		0.159 ps 35	E(level): only observation of a level at this energy, not included in the Adopted Levels.
2713		0.83 ps 35	
2757	5/2+		
2762	11/2-		
3143		0.17 ps 4	
3996§	(5/2+)	0.097 ps# 35	

 † From the Adopted Levels. ‡ From DSAM.§ Level proposed on the basis of (p, γ) results by evaluators.# Tentative value since based on assignment by evaluators that the observed 2440 γ and 2320 γ decay from the 2400- and 3996-keV levels, respectively, which were previously identified in (p, γ) studies. $\gamma(^{41}\text{K})$

E γ	E(level)	E γ	E(level)	E γ	E(level)
980 <i>I</i>	980	1469 <i>I</i>	2762	2320 <i>I</i>	3996
1011 <i>I</i>	2594	1559 <i>I</i>	1559	2440 <i>I</i>	2440
1023 <i>I</i>	2317	1582 <i>I</i>	1582	2508 <i>I</i>	2508
1039 <i>I</i>	2600?	1594 <i>I</i>	1594	2757 <i>I</i>	2757
^x 1144 † <i>I</i>		^x 1655 ‡ <i>I</i>		^x 2814§ <i>I</i>	
1186 <i>I</i>	2167	1677 <i>I</i>	1677	^x 3180# <i>I</i>	
1200 <i>I</i>	2495	1697 <i>I</i>	1697	^x 3490@ <i>I</i>	
1293 <i>I</i>	1293	1849 <i>I</i>	3143		
1418 <i>I</i>	2713	2143 <i>I</i>	2143		

 † $T_{1/2}=0.19$ ps 4. ‡ $T_{1/2}=0.33$ ps 8.§ $T_{1/2}=1.2$ ps 6.# $T_{1/2}<43$ fs.@ $T_{1/2}<19$ fs.^x γ ray not placed in level scheme.

$^{37}\text{Cl}(\alpha,\gamma)$: 4013 Resonance 1981BuZY (continued)

Level Scheme

$^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance 1981BuZY

1981BuZY (also thesis by Burman): E=3–4 MeV. Measured lifetimes by DSAM. Data from two α resonances at E(α)(lab)=3817 5, 4013 5. See also $^{37}\text{Cl}(\alpha,\gamma)$:4013 Resonance.

Others:

1979Zy04 (also 1979ZyZZ): E=2.9–5.23 MeV. Measured E_γ , cross sections for g.s., 980, 1294, 1560, 1677 and 1698 levels. Cross section data analyzed by Hauser–Feshbach calculations.

1973OkZX (also 1973OkZY): E=2–4.2 MeV. Measured E_γ , $\gamma(\theta)$, cross sections. A total of 7 γ rays of 977, 1553, 1661, 1680, 1700, 2177 and 8827 assigned to ^{41}K in the bombardment of of natural barium chloride target. 977 γ , 1553 γ , 1680 γ and 1700 γ probably correspond to g.s. transitions from levels of known energy.

All data are taken from thesis by 1981BuZY, except where noted.

 ^{41}K Levels

E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$	Comments
0.0	3/2+		
980	1/2+	>6.9 ps	
1293	7/2-	>3.1 ps	
1559	3/2+	0.87 ps 28	
1581	3/2-	>1.7 ps	
1677	7/2+	>1.4 ps	
1697	5/2+	1.4 ps 7	
2143	5/2+	0.29 ps 6	
2167	3/2-	>1.25 ps	
2317	5/2-	0.34 ps 10	
2441	(3/2, 5/2+)	0.16 ps 3	E(level): level proposed on the basis of (p, γ) results by evaluators.
2495	9/2+	>2.1 ps	
2508	7/2+	0.43 ps 10	
2713	(7/2)-	0.62 ps 28	
2755	5/2+	<31 fs	
2762	11/2-		
3143	5/2-	0.08 ps 5	

Footnotes continued on next page

$^{37}\text{Cl}(\alpha,\gamma)$: 3817 Resonance $^{1981}\text{BuZY}$ (continued) **^{41}K Levels (continued)**

† From the Adopted Levels.

‡ From DSAM.

 $\gamma(^{41}\text{K})$

$E\gamma$	E(level)	$E\gamma$	E(level)	$E\gamma$	E(level)
980 <i>I</i>	980	1559 <i>I</i>	1559	$\times 2177^\dagger$ 4	
1023 <i>I</i>	2317	1581 <i>I</i>	1581	2441 <i>I</i>	2441
1186 <i>I</i>	2167	$\times 1656$ <i>I</i>		2508 <i>I</i>	2508
1201 <i>I</i>	2495	1677 <i>I</i>	1677	2755 <i>I</i>	2755
1293 <i>I</i>	1293	1697 <i>I</i>	1697	$\times 2814$ <i>I</i>	
1417 <i>I</i>	2713	1849 <i>I</i>	3143	$\times 3182$ <i>I</i>	
1469 <i>I</i>	2762	2143 <i>I</i>	2143	$\times 8827^\dagger$ 4	

† From 1973OkZX.

 $\times$ γ ray not placed in level scheme.**Level Scheme** **$^{38}\text{Ar}(\alpha,p\gamma)$ 1976Li17,1978Li12**

1976Li17 (also 1977Li22): $E(\alpha)=7.5-14.5$ MeV. Measured $E\gamma$, $I\gamma$, excitation function, $\gamma\gamma$ using two GeLi detectors; deduced lifetimes by Doppler Shift Attenuation Method (DSAM). 1977Li22 report remeasurement of the lifetime of the 980 level, which is consistent with their result from 1976Li17.

1978Li12 (from the same group as 1976Li17): $E(\alpha)=9.5$ and 10.75 MeV. Measured $E\gamma$, $I\gamma$, $\gamma(0)$ using an escape-suppressed Ge(Li) detector and $\gamma(\text{lin pol})$ using a three-Ge(Li) Compton-polarimeter.

 ^{41}K Levels

E(level) [†]	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0	3/2+		
980.6 2	1/2+	3.5 ps 10	
1293.8 2	7/2-	>3.1 ps	

Continued on next page (footnotes at end of table)

$^{38}\text{Ar}(\alpha, p\gamma)$ 1976Li17, 1978Li12 (continued) ^{41}K Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	T _{1/2} [§]	Comments
1560.5 2	3/2+	0.42 ps 10	
1582.3 2	3/2-	>3.1 ps	
1593.7 2	1/2, 3/2	97 fs 35	J π : Adopted J π =1/2+.
1677.6 2	7/2+	1.6 ps 4	
1697.8 2	5/2+	0.83 ps 21	
2143.5 2	3/2+, 5/2+	76 fs 21	J π : Adopted J π =5/2+.
2166.4 2	3/2	1.7 ps 6	J π : Adopted J π =3/2-.
2317.2 2	5/2-	0.54 ps 15	
2495.0 2	9/2+	>3.1 ps	
2508.1 2	7/2+	0.16 ps 6	
2528.0 3	11/2+	>3.1 ps	
2713.1 3	3/2-, 7/2-	0.52 ps 15	J π : Adopted J π =(7/2)-.
2756.5 5	3/2+, 5/2+	<69 fs	J π : Adopted J π =5/2+.
2760.8 4	11/2-	0.46 ps 12	
2774.1 3	13/2+	>3.1 ps	
3142.9 5	5/2-, 9/2-	0.16 ps 6	J π : Adopted J π =5/2-.
3235.2 4			
3897.2 5		0.31 ps 8	
4276.2 5		0.10 ps 6	
4984.7 5		>3.1 ps	

[†] From a least-squares fit to E γ .[‡] From 1976Li17 and 1978Li12 based on $\gamma(0, \text{pol})$ data. Differences with the Adopted J π values are indicated in the comments.[§] From DSAM (1976Li17). Results include 25% uncertainty added in quadrature to account for uncertainty in stopping powers. $\gamma(^{41}\text{K})$ A_2 , A_4 and POL are from 1978Li12.

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\ddagger}$	Mult.#	$\delta^{\#}$	Comments
980.6	980.6 2	100			$A_2=0.00$ 1, $A_4=0.00$ 1, POL=-0.02 2.
1293.8	1293.8 3	100	M2+E3	+0.03 +1-2	$A_2=+0.38$ 1, $A_4=-0.06$ 1, POL=-0.57 3.
1560.5	579.8 2	17.6 6	M1+E2	+0.12 4	$A_2=-0.19$ 8, $A_4=0.00$ 9.
	1560.4 3	82.4 6	M1+E2	-0.27 2	$A_2=+0.02$ 1, $A_4=+0.02$ 2, POL=+0.53 5.
1582.3	601.6 2	15.8 7	E1+M2	-0.06 +9-3	$A_2=-0.42$ 4, $A_4=0.00$ 4.
	1582.4 3	84.2 7	E1+M2	-0.08 2	$A_2=+0.17$ 1, $A_4=+0.01$ 1, POL=-0.45 6.
1593.7	613.2 2	39.5 11			
	1593.4 4	60.5 11			$A_2=+0.09$ 6, $A_4=+0.01$ 8, POL=-0.15 17.
1677.6	1677.4 3	100	E2		$A_2=+0.42$ 1, $A_4=-0.19$ 2, POL=+0.77 4.
1697.8	1697.8 3	100	M1+E2	-2.1 2	$A_2=+0.66$ 1, $A_4=+0.20$ 1, POL=-0.05 6.
2143.5	583.1 2				
	1162.8 [§] 3	<4			I γ : <4 1 (1978Li12).
	2143.6 5	<96	M1+E2		I γ : <96 1 (1978Li12).
					δ : +0.31 +16-30 for J(2143)=3/2, -0.15 6 for J(2143)=5/2.
					$A_2=-0.60$ 11, $A_4=-0.13$ 13, POL=-0.42 15.
2166.4	584.1 2				
	1185.9 3		D+Q		$\delta(\text{E2/M1})=-1.3$ 3 for J π (2166)=3/2+. $\delta(\text{M2/E1})=-0.14$ +9-18 for J π (2166)=3/2-.
					$A_2=-0.50$ 4, $A_4=+0.06$ 5, POL=+0.40 2.
2317.2	735.0 [§] 2	6.0 3	D+Q	-0.14 7	$A_2=+0.09$ 5, $A_4=-0.15$ 7.
	1023.2 2	94.0 3	M1+E2	-0.08 1	$A_2=-0.03$ 1, $A_4=+0.04$ 1, POL=-0.09 7.
2495.0	797.3 [§] 2	19.1 10	Q		$A_2=+0.40$ 3, $A_4=-0.20$ 4.
	817.3 2	48.4 14	M1+E2	+0.38 2	$A_2=+0.36$ 2, $A_4=+0.04$ 2, POL=-0.80 6.
	1201.3 3	32.5 11	E1+M2	+0.06 2	$A_2=-0.19$ 3, $A_4=0.00$ 3, POL=+0.47 10.
2508.1	830.5 2	46.8 14	D+Q	+0.36 +27-35	$A_2=+0.53$ 4, $A_4=-0.04$ 4.
	947.5 [§] 2	4.6 5	Q		$A_2=+0.36$ 8, $A_4=+0.03$ 9.
	2508.7 6	48.8 15	E2		$A_2=+0.43$ 4, $A_4=-0.01$ 6, POL=-0.30 4.
2528.0	850.4 2	100	E2		$A_2=+0.34$ 2, $A_4=-0.16$ 2, POL=+0.70 5.
2713.1	395.8 2	13.0 5	M1+E2		δ : +0.15 8 for J(2713)=7/2.
					$A_2=+0.01$ 7, $A_4=-0.01$ 7, POL=-0.35 21.
					δ : -0.37 50 for J(2713)=7/2.
	1419.4 4	87.0 5	M1 (+E2)		$A_2=+0.11$ 4, $A_4=+0.02$ 5, POL=+1.3 7.

Continued on next page (footnotes at end of table)

$^{38}\text{Ar}(\alpha, p\gamma)$ 1976Li17, 1978Li12 (continued)

 $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\ddagger}$	Mult. #	$\delta^{\#}$	Comments
2756.5	2756.4 5	100	M1+E2		δ : +(25 to 55) for $J(2756)=3/2$, -(15 to 50) for $J(2756)=5/2$. $A_2=-0.70$ 8, $A_4=-0.16$ 9, $\text{POL}=-0.9$ 5.
2760.8	1466.9 3	100	E2		$A_2=+0.42$ 2, $A_4=-0.23$ 2, $\text{POL}=+0.73$ 6.
2774.1	246.1 1	100	M1 (+E2)	+0.04 4	$A_2=-0.26$ 1, $A_4=+0.03$ 1, $\text{POL}=-0.45$ 4.
3142.9	1849.0 4	100	M1+E2		δ : +0.87 35 for $J(3143)=5/2$, -0.31 3 for $J(3143)=9/2$. $A_2=-0.75$ 3, $A_4=-0.02$ 2, $\text{POL}=-0.39$ 12.
3235.2	918.0 § 3				
	1941.2 14				
3897.2	1123.1 3	100			
4276.2	1515.4 3	100			
4984.7	708.5 2	100			

† From 1976Li17, except where noted.

‡ From 1978Li12, author's provide only relative branching ratios from individual levels.

§ From 1978Li12.

$^{\#}$ From $\gamma(\theta, \text{pol})$ data in 1978Li12.

Level Scheme

Intensities: % photon branching from each level

$^{41}_{19}\text{K}_{22}$

${}^{39}\text{K}(\text{t},\text{p}\gamma)$ 1976Me09

1976Me09: E(t)=3.0 MeV. Measured E γ , I γ , p γ coincidences using a Ge(Li) detector and an annular Si detector; deduced T $_{1/2}$ using Doppler Shift Attenuation Method (DSAM).
Others: 1982LiZI, 1975TaZL.

 ${}^{41}\text{K}$ Levels

E(level) [†]	J π [‡]	T $_{1/2}$ [§]	E(level) [†]	J π [‡]	T $_{1/2}$ [§]
0.0	3/2+		2448.2 15	(3/2+, 5/2, 7/2+)	
979.6 6	1/2+	0.29 ps +21-10	2494.6 10	9/2+	
1293.1 6	7/2-	>3.5 ps	2508.8 10	7/2+	
1560.0 7	3/2+	0.40 ps 15	2528.9 8	11/2+	>4.9 ps
1582.5 6	3/2-	>1.0 ps	2712.4 10		
1594? 3	1/2+		2758.3 20		
1677.4 6	7/2+	>3.5 ps	2775.5 10	13/2+	
1697.7 6	5/2+	0.90 ps 28	3142.3 [#] 10		
2141.7 12	5/2+		3213.0 10	5/2-	
2163.5 10	3/2-		3236.0 14		
2317.4 10	5/2-				

[†] As given in 1976Me09; authors report only the excitation energies of levels.

[‡] From the Adopted Levels.

[§] From DSAM measurements.

[#] Single level report by 1976Me09, whereas in the Adopted Levels two levels near this energy are reported, one depopulated by the 633.5 γ and the other by the 1849 γ .

 $\gamma({}^{41}\text{K})$

E γ [†]	E(level)	E γ [†]	E(level)	E γ [†]	E(level)
246.6	2775.5	1014.7	2712.4	1697.7	1697.7
580.4	1560.0	1024.3	2317.4	1849.2	3142.3
602.9	1582.5	1183.9	2163.5	1919.9	3213.0
614	1594?	1201.5	2494.6	1942.9	3236.0
616.6	2758.3	1293.1	1293.1	2141.6	2141.7
633.5	3142.3	1419.3	2712.4	2163.4	2163.5
796.9	2494.6	1465.2	2758.3	2448.1	2448.2
817.2	2494.6	1560.0	1560.0	2508.7	2508.8
831.4	2508.8	1582.5	1582.5	2758.2	2758.3
851.5	2528.9	1594	1594?		
979.6	979.6	1677.4	1677.4		

[†] Transitions reported in Figure 1 of 1976Me09, E γ from level-energy differences with E(level) from 1976Me09.

$^{39}\text{K}(\text{t},\text{p}\gamma)$ 1976Me09 (continued)

Level Scheme

 $^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06, 1986Sm13, 1986Bi03

- 1989Sm06, 1986Sm13: $E_p=0.9-1.6$ MeV and $E_p<7$ MeV. Measured E_γ , I_γ , γ yields, $\gamma(\theta)$ using Ge(Li) detector. γ -ray data reported for 45 resonances.
- 1986Bi03: $E_p=0.6-2.3$ MeV. Measured E_γ , I_γ , $\gamma\gamma$, γ yields using two Ge(Li) detectors; deduced $T_{1/2}$ using Doppler Shift Attenuation Method (DSAM).
- 1971Pi12: Measured E_γ , I_γ for 1087, 1102, 1109, 1118 and 1605 resonances; deduced lifetimes by DSAM.
- 2008Vo08: $E_p=0.5-2.7$ MeV. Measured E_γ , I_γ using NaI(Tl) spectrometer.
- 2008Vo03: $E_p=1080-1125$ keV and 1830-1900 keV. Measured E_γ , I_γ using Ge(Li) detector.
- 2011Ka24: $E_p=1.0-3.0$ MeV. Measured E_γ , I_γ using NaI(Tl) detector.
- 2014Ka35: $E_p=1.0-3.0$ MeV. Measured E_γ , I_γ using a NaI(Tl) detector.
- Others:
- 1971Ko32, 1970Ko28 (also 1962Va31, 1960Va07, 1959Va07): $E_p=0.8-3$ MeV and $E_p=1.07-11.12$ MeV. Measured $\gamma(\theta)$, $p\gamma\gamma(\theta)$, deduced IAR. Eight resonances reported.
- 1967Bi126 (also 1964Bi119, 1964Bi106, 1967St30): 34 resonances reported from $E(p)(\text{lab})=1076$ to 1196 keV, relative γ -ray intensities, α -particle decay of three resonances at 1086, 1102 and 1108 keV.
- 1961Ar10, 1964Ar13 (also 1962Ar04): 57 resonances reported by 1961Ar10. γ -ray branchings, summed $\gamma\gamma$ coin data and $p\gamma(\theta)$ for 1101, 1108 and 1118 resonances reported by 1964Ar13.
- 1963Co04: 70 resonances reported from $E(p)(\text{lab})=1029-1648$ keV.
- 1963Ko22: 64 resonances reported from 763-1443 keV. γ rays reported from six resonances at 1091, 1106, 1112, 1123, 1311 and 1391 keV. Measured $p\gamma(\theta)$ for three transitions.
- 1948Br19: $E=0.5-1.8$ MeV. Three resonances observed at 900, 1050 and 1080 keV.

 ^{41}K Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	$E(p)(\text{lab})^\&$	$S(p,\gamma) \text{ eV}^f$	Comments
0.0	3/2+				
980.51 8	1/2+	76 fs +21-4			$T_{1/2}$: from 1971Pi12. Other: 1.0 to 2.6 ps (1986Bi03).
1293.66 9	7/2-	8.3 ns 7			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	$E(\text{p})(\text{lab})^\&$	$S(\text{p},\gamma) \text{ eV}^f$	Comments
1559.92 8	3/2+	0.34 ps 5			$J\pi$: (1/2+) (1971Pi12).
1582.10 6	3/2-	9.3 ps 4			$T_{1/2}$: other: 0.10 ps +14-4 (1971Pi12).
1592.99 11	1/2+	≤ 0.24 ps			$J\pi$: (5/2+) (1971Pi12).
1677.1 2	7/2+	> 0.17 ps			$T_{1/2}$: other: > 0.10 ps (1971Pi12).
1698.00 2	5/2+	49 fs 28			$J\pi$: 1989Sm06 allow 3/2 also.
2143.8 1	5/2+	≤ 0.18 ps			$J\pi$: (5/2+, 7/2+) (1971Pi12).
2166.73 9	3/2-	1.94 ps 14			$T_{1/2}$: from 1971Pi12.
2316.8 2	5/2-	≤ 0.21 ps			$T_{1/2}$: from 1971Pi12. Other: ≤ 0.64 ps (1986Bi03).
2440.1 2	(3/2, 5/2+)				E(level): from the Adopted Levels.
2494.6 2	9/2+				$T_{1/2}$: other: > 0.11 ps (1971Pi12).
2507.9 4	7/2+				$J\pi$: 1989Sm06 allow 3/2+ also; (5/2+) (1971Pi12).
2527 1	11/2+				(1971Pi12).
2593.38 8	1/2-, 3/2-	7.6 fs 42			$J\pi$: (1/2, 3/2) (1971Pi12).
2674.3 5	1/2+				$T_{1/2}$: other: > 0.10 ps (1971Pi12).
2710.3 2	3/2+, 5/2+				$J\pi$: (5/2+, 7/2+) (1971Pi12).
2712.4 2	(7/2)-	≤ 0.54 ps			$J\pi$: (1/2, 3/2) (1971Pi12).
2756.2 5	5/2+				E(level): from 1986Bi03.
3047.0 10	1/2-, 3/2-				E(level): from 1986Bi03.
3141.3# 13	(7/2-), 5/2-				$T_{1/2}$: from 1971Pi12.
3179.8 2	3/2+, 5/2+				$J\pi$: 1989Sm06 allow 1/2- also; 1971Pi12 give (3/2-, 5/2-).
3213.2 2	5/2-				E(level): 83% of the depopulating γ -intensity is unobserved.
3229.8 6	(1/2+, 3/2, 5/2+)				E(level): from 1986Bi03.
3235.6 2	(3/2-, 5/2, 7/2-)				$J\pi$: (5/2) (1971Pi12), 3/2- (1989Sm06).
3277.9 5	(1/2, 3/2, 5/2+)				
3450.1 2	5/2-, 7/2-	4.2 fs 28			$J\pi$: 1989Sm06 give 9/2+, (5/2+).
3488.5 3	(5/2)+	< 3.5 fs			E(level): 40% of the depopulating γ -intensity is unobserved.
3571.9 2					$J\pi$: 1989Sm06 give 1/2, 3/2, 5/2, 7/2-.
3579.2 5					$J\pi$: 1989Sm06 allow 3/2-, 7/2- also.
3614.8 10					$J\pi$: 1989Sm06 allow 3/2+, 5/2+ also.
3626.1 5					
3651	(5/2, 7/2-)				$T_{1/2}$: from 1971Pi12.
3740.1 10	1/2-, 3/2-				$J\pi$: 1989Sm06 allow 3/2, 5/2+ also. 1971Pi12 give (5/2).
3761.54 5		4.9 fs 28			$T_{1/2}$: from 1971Pi12.
3774.3 5	5/2-, 7/2-				$J\pi$: 1989Sm06 give (3/2, 5/2)- also.
3861.3 5	(1/2, 3/2, 5/2+)				E(level): from 1986Bi03.
3911.7 6	1/2-, 3/2-				$J\pi$: 1989Sm06 give 1/2, 3/2, 5/2.

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) ^{41}K Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	$T_{1/2}^{\S}$	E(p)(lab)&	S(p, γ) eV ^f	Comments
4026.7 5					E(level): this level presumably differs from 4026.94 6 in (n, γ) (1984Kr05) since the decay branchings differ significantly, <i>e.g.</i> no evidence of a 2470 γ in (p, γ).
4164.7 10					
4340.9 5	(1/2, 3/2, 5/2)				
4674 3					E(level): from 1971Pi12.
4745.2 5	(5/2+)				
4848.5 5	(3/2)-				
4962.3 5	(1/2, 3/2, 5/2)				
5101.2 20	1/2-, 3/2-				
5401.7 5	1/2-, 3/2-				
8300@			551 g		
8552@ 2			763 a		
8587@ 1			799 g	0.34 g	E(p)(lab): others: 799 (1961Ar10), 800 (1963Ko22).
8607@ 1			819 g	0.25 g	E(p)(lab): other: 819 (1961Ar10).
8643@ 1			854 g	0.25 g	E(p)(lab): others: 856 (1961Ar10), 855 (1963Ko22).
8674@			889 g	0.08 g	
8684@ 1			898 d		E(p)(lab): doublet (1961Ar10). Other: 898 (1963Ko22).
8690@ 1			904 g	0.7 g	E(p)(lab): others: 904 (1961Ar10), 904 (1963Ko22).
8697@ 1			911 g	0.6 g	E(p)(lab): others: 911 (1961Ar10), 913 (1963Ko22).
8705@ 1			920 d		E(p)(lab): others: 921 (1963Ko22).
8724@ 2			939 a		
8727@ 1			943 d	0.18	E(p)(lab): others: 942 (1961Ar10), 943 (1963Ko22).
8735@ 1			950 g	0.8 g	E(p)(lab): others: 950 (1961Ar10), 950 (1963Ko22).
8747@ 2			960 d	0.5	E(p)(lab): doublet (1961Ar10). E(p)(lab): others: 962 (1961Ar10), 965 (1963Ko22).
8758.5@ 6	(1/2, 3/2, 5/2)		974.3 b	0.7 2	$J\pi$: γ to 1/2+ disfavors 5/2-. E(p)(lab): others: 972 (2008Vo08) 973 1 (1961Ar10), 977 (1963Ko22). S(p, γ) eV: other: 1.0 (2008Vo08).
8770.1@ 6	(3/2, 5/2+)		986.2 b	1.6 3	$J\pi$: γ 's to 1/2+, 5/2+ and 5/2-. E(p)(lab): others: 984 (2008Vo08), 985 (1961Ar10), 988 (1963Ko22). S(p, γ) eV: other: 1.1 (2008Vo08).
8779@ 1			995 g	0.6 g	E(p)(lab): others: 995 (1961Ar10), 998 (1963Ko22).
8789.6@ 10			1006.2 b	0.8 g	E(p)(lab): others: 1004 (2008Vo08), 1005 (1961Ar10), 1008 (1963Ko22).
8803@ 2			1020 a	1.0 g	E(p)(lab): others: 1015 (2008Vo08), 1015 (1961Ar10 for a doublet).
8812@ 1			1029 g	0.66 g	E(p)(lab): others: 1029 (1961Ar10), 1028 (1963Ko22), 1029 (1963Co04).
8814.8@ 6			1032.0 b		
8831@ 1			1049 g	0.3 g	E(p)(lab): others: 1049 (1961Ar10).
8834@ 1			1052 g	1.1 g	E(p)(lab): others: 1052 (1961Ar10), 1055 (1963Ko22), 1050 (1963Co04).
8840@ 2			1058 a		
8845.1@ 6			1063.0 b	0.4 g	E(p)(lab): others: 1061 (1961Ar10), 1066 (1963Ko22), 1058 (1963Co04), 1061 (2008Vo08).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	$E(\text{p})(\text{lab})^\&$	$S(\text{p},\gamma) \text{ eV}^\text{f}$	Comments
8851.4@ 6	(1/2, 3/2, 5/2)		1069.5 ^b	0.7 2	$J\pi$: γ to 1/2+ disfavors 5/2-. $E(\text{p})(\text{lab})$: others: 1068 (1961Ar10), 1074 (1963Ko22), 1066 (1963Co04), 1068 (2008Vo08). $S(\text{p},\gamma) \text{ eV}$: other: 0.4 (2008Vo08).
8858.4@ 4			1076.7 ^c	0.6 ^g	$E(\text{p})(\text{lab})$: others: 1074 (1961Ar10), 1079 (1963Ko22), 1074.6 (1970Ko28), 1072 (1963Co04), 1074 (2008Vo08).
8863.9@ 4			1082.3 ^c	0.6 ^g	$E(\text{p})(\text{lab})$: others: 1081 (1961Ar10), 1086 (1963Ko22), 1081 (2008Vo08).
8864.5@ 6	(3/2, 5/2+)		1082.9 ^b	1.0 2	$J\pi$: γ to 7/2- disfavors 3/2+.
8868.6@ 6	(3/2, 5/2)	7.9 eV 19	1087.1 ^b	2.1 3	$J\pi$: 3/2- (1971Pi12). $T_{1/2}$: Γ from 1967Bl26; $\Gamma_p/\Gamma=0.49$ 16, $\Gamma_\alpha=0.032$ eV 12 (1967Bl26), $\Gamma_\gamma=1.7$ eV (2008Vo03). $E(\text{p})(\text{lab})$: others: 1086 (1961Ar10), 1091 (1963Ko22), 1086.2 (1970Ko28), 1086.5 3 (1967Bl26), 1092 (1963Co04), 1086 (2008Vo08). $S(\text{p},\gamma) \text{ eV}$: others: 3.6 (2008Vo08), 2.4 4 (2008Vo03).
8877.4@ 4			1096.2 ^c	0.4 2	$E(\text{p})(\text{lab})$: doublet: 1096.2+1096.4. $E(\text{p})(\text{lab})$: others: 1096 (1961Ar10), 1098 (1963Co04), 1096 (2008Vo03). $S(\text{p},\gamma) \text{ eV}$: from 2008Vo03.
8880.4@ 4			1099.3 ^c		
8882.7 3	3/2(-)	21.9 eV 25	1101.7	8.0 10	$T=5/2$. $J\pi$: $p\gamma(\theta)$ (1964Ar13). $T_{1/2}$: Γ from 1967Bl26. $\Gamma_p/\Gamma=0.58$ 8, $\Gamma_\alpha=0.040$ eV 10 (1967Bl26), $\Gamma_\gamma=3.4$ (2008Vo03). $E(\text{p})(\text{lab})$: from 1967St30. 1102.4 5 in 1989Sm06. Others: 1101 (1961Ar10), 1106 (1963Ko22), 1101.0 (1970Ko28,1971Ko32), 1101.8 3 (1967Bl26), 1104 (1963Co04), 1102 (2008Vo08,2008Vo03,2014Ka35). Possible IAR of 520 in ^{41}Ar . $S(\text{p},\gamma) \text{ eV}$: other: 8.0 (2008Vo08), 8.0 5 (2008Vo03).
8889.8@ 6	3/2, 5/2+	5.1 eV 8	1108.9 ^b	2.1 3	$J\pi$: 1964Ar13 and 1971Pi12 give 3/2. $T_{1/2}$: Γ from 1967Bl26. $\Gamma_p/\Gamma=0.70$ 15, $\Gamma_\alpha=0.019$ eV 6 (1967Bl26), $\Gamma_\gamma=1.1$ (2008Vo03). $E(\text{p})(\text{lab})$: others: 1108 (1961Ar10,2014Ka35), 1112 (1963Ko22), 1107.6 (1970Ko28), 1108.4 3 (1967Bl26), 1118 (2008Vo08). $S(\text{p},\gamma) \text{ eV}$: others: 3.1 (2008Vo08), 2.0 3 (2008Vo03), 2.0 (2014Ka35).
8894.3@ 4			1113.5 ^c		
8898.0@ 4			1117.3 ^c		
8898.6@ 4			1117.9 ^c		
8899.4@ 4	$\geq 3/2$		1118.7 ^c		$J\pi$: not 1/2 from $p\gamma(\theta)$ (1964Ar13), 1971Pi12 give 3/2 for 1118.4 6 resonance. $E(\text{p})(\text{lab})$: others: 1118 (1961Ar10, 2014Ka35), 1123 (1963Ko22), 1118.1 (1970Ko28), 1114 (1963Co04), 1118 (2008Vo03, reported as quadruplet). $S(\text{p},\gamma) \text{ eV}$: 2.2 3 for quadruplet at 1118 keV (2008Vo03), 3.0 for level at 1118 keV (2014Ka35).
8900.4@ 4			1119.8 ^c		
8910.9@ 4			1130.5 ^c		
8917.3@ 4			1137.1 ^c		
8918.9@ 4			1138.7 ^c		

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{p}(\text{lab}))^\&$	$S(\text{p},\gamma) \text{ eV}^f$	Comments
8920.1@ 4		1140.0 ^c		E(p)(lab): others: 1139 (1961Ar10,2014Ka35), 1141 (1963Ko22), 1136 (1963Co04), 1139 (2008Vo08). S(p, γ) eV: 1.4 for level at 1139 keV (2014Ka35).
8922.0@ 4		1141.9 ^c		
8926.9@ 4		1146.9 ^c		
8930.2@ 4		1150.3 ^c		
8932.0@ 4		1152.1 ^c	1.0 ^g	E(p)(lab): others: 1152 (1961Ar10,2008Vo08,2014Ka35), 1159 (1963Ko22), 1149 (1963Co04). S(p, γ) eV: other: 1.7 (2014Ka35).
8933.8@ 4		1154.0 ^c		
8939.4@ 4		1159.7 ^c		
8942.4@ 8	(3/2-, 5/2-)	1162.8 ^b	0.9 3	J π : γ to 1/2+ disfavors 5/2-. E(p)(lab): others: 1162 (1961Ar10,2008Vo08), 1164 (1963Ko22), 1162.8 3 (1967Bl26), 1161 (2014Ka35). S(p, γ) eV: others: 1.2 (2008Vo08), 0.7 (2014Ka35).
8945.0@ 4		1165.5 ^c		
8948.3@ 4		1168.9 ^c		
8952.1@ 4		1172.8 ^c		
8956.8@ 4		1177.6 ^c		
8958.7@ 8	(1/2+, 3/2-, 5/2+)	1179.5 ^b	2.3 5	E(p)(lab): others: 1179 (1961Ar10), 1184 (1963Ko22), 1179.2 3 (1967Bl26), 1175 (1963Co04), 1177 (2014Ka35). S(p, γ) eV: other: 1.6 (2014Ka35).
8963.8@ 4		1184.7 ^c		
8965.3@ 4		1186.3 ^c	1.5 ^g	E(p)(lab): others: 1186 (1961Ar10,2008Vo08), 1182 (1963Co04), 1184 (2014Ka35). S(p, γ) eV: other: 1.6 (2014Ka35).
8972.8@ 4		1194.0 ^c	0.8 ⁱ	E(p)(lab): others: 1194 (1961Ar10,2014Ka35), 1192 (1963Ko22), 1191 (1963Co04).
8974.5@ 4		1195.7 ^c	0.6 ^g	E(p)(lab): others: 1200 (1961Ar10,1963Ko22, 2008Vo08), 1196 (1963Co04), 1199 (2014Ka35). S(p, γ) eV: other: 0.4 (2014Ka35).
8982@ 1		1207 ^d	1.2 ^g	E(p)(lab): others: 1205 (1963Ko22), 1204 (1963Co04,2014Ka35), 1207 (2008Vo08). S(p, γ) eV: other: 0.5 (2014Ka35).
8996@ 1		1217 ^d	0.3 ^g	E(p)(lab): others: 1212 (1963Ko22), 1215 (1963Co04), 1217 (2008Vo08,2014Ka35). S(p, γ) eV: other: 0.6 (2014Ka35).
9000@ 1		1222 ^d	0.4 ⁱ	E(p)(lab): others: 1224 (1963Ko22), 1220 (1963Co04), 1221 (2014Ka35).
9007@ 1		1229 ^d	0.4 ⁱ	E(p)(lab): others: 1229 (1963Ko22,2014Ka35), 1226 (1963Co04).
9018.8@ 6	(1/2-, 3/2-, 5/2+)	1241.1 ^b	2.4 5	E(p)(lab): others: 1240 (1961Ar10), 1246 (1963Ko22), 1236 (1963Co04), 1238 (2014Ka35). S(p, γ) eV: other: 2.0 (2014Ka35).
9022.5@ 6		1244.9 ^b	1.3 ⁱ	E(p)(lab): others: 1244 (1961Ar10), 1250 (1963Ko22), 1247 (1963Co04), 1244 (2008Vo08), 1241 (2014Ka35).
9026@ 1		1249 ^d	0.6 ⁱ	
9035@ 1		1258 ^d	0.3 ^g	E(p)(lab): others: 1265 (1963Ko22), 1258 (1963Co04, 2008Vo08), 1256 (2014Ka35).
9039@ 1		1262 ^d	0.8 ^g	E(p)(lab): others: 1269 (1963Ko22), 1263 (1963Co04), 1268 (2008Vo08), 1260 (2014Ka35).
9047.2@ 6		1270.2 ^b	0.7 ^g	E(p)(lab): others: 1268 (1961Ar10, 2008Vo08), 1275 (1963Ko22), 1274 (1963Co04), 1266 (2014Ka35).
9057.4@ 6		1280.7 ^b	2.6 ⁱ	
9061.1@ 6		1284.5 ^b	2.2 ^g	E(p)(lab): others: 1283 (1961Ar10, 2008Vo08), 1293 (1963Ko22), 1263 (1963Co04).
9070.8@ 6	(3/2-, 5/2-)	1294.4 ^b	2.5 5	J π : γ to 1/2+ disfavors 5/2-. 7/2- is not completely excluded but very unlikely. E(p)(lab): others: 1293 (1961Ar10, 2008Vo08,2014Ka35), 1300 (1963Ko22,1963Co04). S(p, γ) eV: others: 1.1 (2008Vo08), 2.6 (2014Ka35).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{p})(\text{lab})^\&$	$S(\text{p},\gamma) \text{ eV}^f$	Comments
9081.3@ 6	3/2	1305.2 ^b	2.1 5	E(p)(lab): others: 1303 (1961Ar10, 2008Vo08), 1311 (1963Ko22), 1316 (1963Co04), 1302 (2011Ka24,2014Ka35). S(p, γ) eV: others: 1.4 (2008Vo08), 3.1 (2011Ka24), 3.9 (2014Ka35).
9099.2@ 6	(3/2, 5/2)	1323.6 ^b	0.8 3	J π : γ to 1/2+ disfavors 5/2-. E(p)(lab): others: 1321 (1961Ar10, 2008Vo08), 1318 (2014Ka35). S(p, γ) eV: others: 0.9 (2008Vo08), 1.3 (2014Ka35).
9107@ 1		1331 ^d	2.3 ^g	E(p)(lab): others: 1331 (1963Ko22,1963Co04), 1333 (2008Vo08), 1332 (2014Ka35). S(p, γ) eV: other: 0.8 (2014Ka35).
9112.5@ 6	(3/2, 5/2)	1337.2 ^b	1.0 3	E(p)(lab): others: 1336 (1961Ar10), 1338 (1963Ko22), 1346 (1963Co04), 1338 (2014Ka35). S(p, γ) eV: other: 1.7 (2014Ka35).
9121@		1346 ^h	1.2 ^h	
9126.6@ 6		1351.6 ^b	0.9 ^g	E(p)(lab): others: 1349 (1961Ar10,1963Ko22, 2008Vo08), 1351 (1963Co04), 1352 (2014Ka35). S(p, γ) eV: other: 1.6 (2014Ka35).
9132.0@ 6		1357.2 ^b	1.1 ^g	E(p)(lab): others: 1358 (1961Ar10, 2008Vo08), 1356 (1963Co04), 1359 (2014Ka35). S(p, γ) eV: other: 1.1 (2014Ka35).
9138.4@ 6	(1/2+, 3/2, 5/2+)	1363.7 ^b	1.5 5	E(p)(lab): others: 1365 (1961Ar10, 2008Vo08,2014Ka35), 1363 (1963Ko22), 1366 (1963Co04). S(p, γ) eV: others: 0.3 (2008Vo08), 1.0 (2014Ka35).
9144.8@ 6		1370.3 ^b		E(p)(lab): others: 1368 (1961Ar10), 1370 (1963Ko22).
9148.1@ 6	(3/2, 5/2+)	1373.7 ^b	1.2 4	J π : 5/2- is not completely excluded but very unlikely. E(p)(lab): others: 1372 (1961Ar10, 2008Vo08), 1378 (1963Co04), 1371 (2014Ka35). S(p, γ) eV: other: 2.3 (2008Vo08), 1.1 (2014Ka35).
9156@ 2		1382 ^a		
9158.3@ 6	(1/2-, 3/2, 5/2)	1384.2 ^b	1.9 5	J π : γ to 1/2+ disfavors 5/2-. 7/2- is not completely excluded but very unlikely. E(p)(lab): others: 1386 (1963Ko22), 1385 (2014Ka35). 2008Vo08 give a resonance at $E_p=1387$ with $S=5.6$. S(p, γ) eV: other: 0.5 (2014Ka35).
9163.3@ 6		1389.3 ^b		E(p)(lab): others: 1391 (1963Ko22), 1389 (1963Co04), 2008Vo08 give a resonance at $E_p=1387$ with $S=5.6$.
9167.7@ 6		1393.8 ^b		
9183.7@ 6	(3/2, 5/2+)	1410.2 ^b	2.1 5	E(p)(lab): others: 1401 (1963Ko22), 1416 (1963Co04), 1408 (2008Vo08), 1406 (2014Ka35). S(p, γ) eV: others: 0.9 (2008Vo08), 2.1 (2014Ka35).
9195.3@ 6	(1/2, 3/2, 5/2+)	1422.1 ^b	2.4 8	E(p)(lab): others: 1417 (1963Ko22), 1420 (1963Co04), 1420 (2008Vo08), 1418 (2014Ka35). S(p, γ) eV: others: 0.7 (2008Vo08), 1.2 (2014Ka35).
9200.2@ 6	(3/2, 5/2)+	1427.1 ^b	2.6 9	E(p)(lab): others: 1429 (1963Ko22), 1424 (1963Co04), 1428 (2008Vo08), 1425 (2014Ka35). S(p, γ) eV: others: 1.4 (2008Vo08), 2.5 (2014Ka35).
9202.8@ 6	(1/2+, 3/2, 5/2+)	1429.8 ^b	2.2 5	E(p)(lab): others: 1433 (1963Ko22), 1434 (1963Co04,2008Vo08), 1431 (2014Ka35). S(p, γ) eV: others: 0.5 (2008Vo08), 0.4 (2014Ka35).
9209.0@ 6		1436.1 ^b	3.0	E(p)(lab): others: 1437 (1963Ko22), 1441 (1963Co04, 2011Ka24,2014Ka35). S(p, γ) eV: from 2011Ka24. Other 3.7 (2014Ka35).
9219.6@ 6	(3/2, 5/2+)	1447.0 ^b	2.2 5	E(p)(lab): others: 1443 (1963Ko22), 1449 (1963Co04,2014Ka35), 1444 (2008Vo08). S(p, γ) eV: others: 1.9 (2008Vo08), 0.9 (2014Ka35).
9226.4@ 6	(1/2, 3/2, 5/2, 7/2-)	1454.0 ^b	1.0 2	E(p)(lab): others: 1454 (1963Co04,2014Ka35), 1458 (2008Vo08). S(p, γ) eV: others: 0.5 (2008Vo08), 1.9 (2014Ka35).
9232.0@ 10	(3/2, 5/2+)	1459.7 ^b	1.8 4	E(p)(lab): others: 1463 (1963Co04), 1466 (2008Vo08), 1462 (2014Ka35). S(p, γ) eV: others: 1.3 (2008Vo08), 2.3 (2014Ka35).
9247@ 3		1475 ^e	3.8 ^g	E(p)(lab): others: 1477 (2008Vo08), 1474 (2014Ka35). S(p, γ) eV: other: 4.2 (2014Ka35).
9252@ 3		1480 ^e	1.5 ⁱ	E(p)(lab): other: 1484 (2014Ka35).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{p})(\text{lab})^\&$	$S(\text{p},\gamma) \text{ eV}^f$	Comments
9262.5@ 12	(1/2+, 3/2, 5/2+)	1491.0 ^b	1.0 2	E(p)(lab): others: 1486 (1963Co04), 1488 (2008Vo08), 1493 (2014Ka35). S(p, γ) eV: others: 0.8 (2008Vo08), 2.1 (2014Ka35).
9270.7@ 6	(3/2, 5/2+)	1499.4 ^b	1.3 4	E(p)(lab): others: 1495 (1963Co04), 1496 (2008Vo08), 1501 (2014Ka35). S(p, γ) eV: others: 0.99 (2008Vo08), 1.8 (2014Ka35).
9277@ 3		1506 ^e		
9281.0@ 6	(3/2-, 5/2+)	1509.9 ^b	2.4 6	E(p)(lab): others: 1509 (1963Co04), 1510 (2008Vo08). S(p, γ) eV: other: 1.2 (2008Vo08).
9284.7@ 6	(3/2, 5/2+)	1513.7 ^b	2.2 6	E(p)(lab): others: 1515 (1963Co04), 1517 (2008Vo08), 1513 (2014Ka35). S(p, γ) eV: others: 1.3 (2008Vo08), 3.0 (2014Ka35).
9290.7@ 6	(1/2+, 3/2, 5/2+)	1519.9 ^b	2.9 8	E(p)(lab): other: 1523 (1963Co04).
9301@ 3		1530 ^e	5.6 ^g	S(p, γ) eV: other: 4.8 for a level at $E_p=1528$ (2014Ka35).
9304@ 3		1533 ^e		
9315@ 3		1545 ^e	2.0 ^g	E(p)(lab): others: 1552 (2008Vo08), 1542 (2014Ka35). S(p, γ) eV: other: 1.5 (2014Ka35).
9329.0@ 6		1559.2 ^b	3.0 ^g	E(p)(lab): others: 1554 (1963Co04), 1556 (2008Vo08), 1551 (2014Ka35). S(p, γ) eV: other: 4.2 (2014Ka35).
9333@		1563 ⁱ	3.3 ⁱ	
9340.3@ 6		1570.7 ^b	2.6 ^g	E(p)(lab): others: 1567 (1963Co04), 1571 (2008Vo08,2014Ka35). S(p, γ) eV: other: 0.9 (2014Ka35).
9344@		1574 ^h	2.0 ^h	
9348@ 3		1579 ^e	2.6 ^g	E(p)(lab): other: 1581 (2008Vo08,2014Ka35).
9353@ 3		1584 ^e	4.9	E(p)(lab): other: 1583 (2011Ka24,2014Ka35). S(p, γ) eV: from 2011Ka24. Other: 6.7 (2014Ka35).
9361.0@ 6	5/2+	1592.0 ^b	5.2 15	E(p)(lab): others: 1600 (1971Ko32), 1598 (1963Co04), 1590 (2008Vo08), 1597 (2014Ka35). S(p, γ) eV: others: 4.1 (2008Vo08), 11.3 (2014Ka35).
9374.2	3/2-	1605.4	8.5 ^g	$J\pi$: from 1971Ko32, 1971Pi12 give (3/2). Possible IAR of 1030 in ^{41}Ar . E(p)(lab): from 1971Pi12. Others: 1602 (1963Co04, 2008Vo08), 1600 (1971Ko32), 1597 (2011Ka24). S(p, γ) eV: other: 10.3 (2011Ka24).
9378@ 3		1609 ^e	4.2 ^h	E(p)(lab): other: 1608 (2014Ka35).
9382@ 3		1613 ^e	4.7 ^g	E(p)(lab): others: 1616 (2008Vo08), 1618 (2014Ka35). S(p, γ) eV: other: 3.9 (2014Ka35).
9394@ 3		1626 ^e	4.1 ^g	E(p)(lab): other: 1623 (2008Vo08), 1630 (2014Ka35). S(p, γ) eV: other: 4.5 (2014Ka35).
9406@ 3		1638 ^e	2.7 ^g	E(p)(lab): other: 1638 (2008Vo08).
9416@ 3		1648 ^e	3.2 ^g	E(p)(lab): others: 1648 (2008Vo08), 1649 (2014Ka35). $\Gamma_\gamma=0.8$ eV (2008Vo08). S(p, γ) eV: other: 1.2 (2014Ka35).
9420@		1652 ^g	0.2 ^g	S(p, γ) eV: other: 0.9 for a level at $E_p=1654$ (2014Ka35).
9424@		1656 ^g	0.2 ^g	$\Gamma_\gamma=0.1$ eV (2008Vo08). S(p, γ) eV: other: 1.2 for a level at $E_p=1660$ (2014Ka35).
9437@		1670 ^g	0.5 ^g	$\Gamma_\gamma=0.1$ eV (2008Vo08). S(p, γ) eV: other: 2.1 (2014Ka35).
9442@		1675 ^g	2.6 ^g	S(p, γ) eV: other: 1.7 for a level at $E_p=1670$ (2014Ka35).
9448@		1681 ⁱ	1.6 ⁱ	
9453@		1686 ^g	0.9 ^g	S(p, γ) eV: other: 2.6 for a level at $E_p=1684$ (2014Ka35).
9462@		1695 ⁱ	5.7 ⁱ	
9469@		1702 ^g	2.7 ^g	S(p, γ) eV: other: 1.1 for a level at $E_p=1703$ (2014Ka35).
9474@		1707 ⁱ	1.6 ⁱ	
9480@		1714 ^g	2.4 ^g	S(p, γ) eV: other: 2.4 for a level at $E_p=1710$ (2014Ka35).
9487@		1723 ⁱ	6.9 ⁱ	
9496@		1730 ^g	7.8 ^g	S(p, γ) eV: other: 2.5 for a level at $E_p=1731$ (2014Ka35).
9506@		1740 ^g	13.8 ^g	S(p, γ) eV: other: 3.3 for a level at $E_p=1736$ (2014Ka35).
9507@		1741 ⁱ	0.9 ⁱ	
9510@		1744 ⁱ	2.1 ⁱ	
9517@		1752 ^g	0.5 ^g	$\Gamma_\gamma=0.3$ eV (2008Vo08). S(p, γ) eV: other: 2.1 for a level at $E_p=1749$ (2014Ka35).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{p})(\text{lab})^\&$	$S(\text{p},\gamma) \text{ eV}^f$	Comments
9527@		1762g	0.5g	$S(\text{p},\gamma)$ eV: other: 4.0 for a level at $E_p=1757$ (2014Ka35).
9529@		1764g	1.5g	$\Gamma_\gamma=0.4$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 4.2 for a level at $E_p=1765$ (2014Ka35).
9537@		1772g	1.0g	$\Gamma_\gamma=0.5$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 3.6 for a level at $E_p=1773$ (2014Ka35).
9543@		1778g	2.0g	$S(\text{p},\gamma)$ eV: other: 2.7 for a level at $E_p=1780$ (2014Ka35).
9550@		1785g	0.4g	$S(\text{p},\gamma)$ eV: other: 3.8 for a level at $E_p=1786$ (2014Ka35).
9559@		1795g	0.7g	$\Gamma_\gamma=0.2$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 6.3 for a level at $E_p=1798$ (2014Ka35).
9568@		1804g	4.6g	$\Gamma_\gamma=2.4$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 1.0 for a level at $E_p=1803$ (2014Ka35).
9573@		1808i	3.6i	
9578@		1814g	2.4g	$\Gamma_\gamma=0.6$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 1.6 for a level at $E_p=1816$ (2014Ka35).
9585@		1821g	0.6g	
9591@		1827g	1.2g	$S(\text{p},\gamma)$ eV: other: 1.8 for a level at $E_p=1826$ (2014Ka35).
9594@		1831g	1.2g	$\Gamma_\gamma=0.3$ eV (2008Vo08).
9602@	3/2-	1839g	3.9 4	$\Gamma_\gamma=0.8$ eV (2008Vo08), 1.0 (2008Vo03).
				$J\pi$: from $\gamma(\theta)$ in 2008Vo03.
				$S(\text{p},\gamma)$ eV: from 2008Vo03. Others: 3.2 (2008Vo08), 5.8 for a level at $E_p=1835$ (2011Ka24), 7.2 for a level at 1835 (2014Ka35).
9605@	3/2-	1842g	3.3g 3	$S(\text{p},\gamma)$ eV: from 2008Vo03. Others: 3.0 (2008Vo08), 5.0 (2014Ka35).
				$\Gamma_\gamma=0.8$ (2008Vo03).
				$J\pi$: from $\gamma(\theta)$ in 2008Vo03.
9615@		1851i	3.0i	
9622@	3/2-	1859g	0.8 2	$\Gamma_\gamma=0.2$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: from 2008Vo03. Others: 0.8 (2008Vo08), 1.7 for a level at $E_p=1856$ (2014Ka35).
				$J\pi$: from $\gamma(\theta)$ in 2008Vo03.
9632	3/2-	1870	2.8 3	$E(\text{p})(\text{lab}), J\pi$: from 1971Ko32. This resonance exhibits a multiplet structure. Other: $E_p=1875$ (2003Vo08,2008Vo08) 1868 (2011Ka24,2014Ka35).
				Possible IAR of 1350 in ^{41}Ar .
				$\Gamma_\gamma=1.0$ eV (2008Vo08), 0.7 (2008Vo03).
				$S(\text{p},\gamma)$ eV: from 2008Vo03. Other: 3.9 (2008Vo08), 5.6 (2011Ka24), 6.9 (2014Ka35).
9643@		1880i	1.2i	
9658@	3/2-	1896g	4.1 4	$\Gamma_\gamma=1.1$ eV (2008Vo08), 1.0 (2008Vo03).
				$S(\text{p},\gamma)$ eV: from 2008Vo03. Others: 4.4 (2008Vo08), 5.4 (2011Ka24), 6.6 (2014Ka35).
				$J\pi$: 3/2 from $\gamma(\theta)$ in 2008Vo03, π from consideration of RUL of depopulating transitions (2008Vo03).
				$E(\text{p})(\text{lab})$: other: 1890 (2011Ka24,2014Ka35).
9671@		1909g	0.6g	$\Gamma_\gamma=0.3$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: others: 5.9 for a level at $E_p=1907$ (2011Ka24), 7.3 for a level at $E_p=1907$ (2014Ka35).
9677@		1916g	4.0g	$\Gamma_\gamma=3.0$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: others: 7.0 for a level at $E_p=1917$ (2011Ka24), 4.2 for a level at $E_p=1917$ (2014Ka35).
9687@		1926g	3.5g	$\Gamma_\gamma=0.6$ eV (2008Vo08).
9692@		1931g	0.7g	$\Gamma_\gamma=0.4$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 4.9 for a level at $E_p=1934$ (2011Ka24), 6.0 for a level at 1934 (2014Ka35).
9702@		1941g	2.1g	$S(\text{p},\gamma)$ eV: other: 2.6 (2014Ka35).
9708@		1947g	3.6g	$S(\text{p},\gamma)$ eV: other: 3.7 for a level at $E_p=1950$ (2014Ka35).
9712@		1951g	0.6g	$S(\text{p},\gamma)$ eV: other: 3.7 for a level at $E_p=1953$ (2014Ka35).
9719@		1959g	3.8g	$\Gamma_\gamma=1.9$ eV (2008Vo08).
				$S(\text{p},\gamma)$ eV: other: 3.5 for a level at $E_p=1964$ (2014Ka35).
9730@		1970g	0.9g	$S(\text{p},\gamma)$ eV: other: 1.4 for a level at $E_p=1969$ (2014Ka35).
9731@		1971g	0.9g	
9739@		1979g	1.1g	$S(\text{p},\gamma)$ eV: other: 4.2 for a level at $E_p=1976$ (2014Ka35).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

E(level) [†]	E(p)(lab)&	S(p, γ) eV ^f	Comments
9745@	1985g	5.0g	$\Gamma_{\gamma}=2.5$ eV (2008Vo08). S(p, γ) eV: other: 1.5 for a level at Ep=1988 (2014Ka35).
9755@	1996g	0.9g	S(p, γ) eV: other: 2.8 for a level at Ep=1993 (2014Ka35).
9762@	2003g	2.7g	$\Gamma_{\gamma}=1.4$ eV (2008Vo08). S(p, γ) eV: other: 1.3 for a level at Ep=2005 (2014Ka35).
9770@	2010 ⁱ	3.6 ⁱ	
9780@	2021g	5.5g	S(p, γ) eV: other: 2.9 for a level at Ep=2019 (2014Ka35).
9789@	2030 ⁱ	10.1 ⁱ	S(p, γ) eV: other: 8.2 (2011Ka24).
9797@	2039g	2.6g	$\Gamma_{\gamma}=0.7$ eV (2008Vo08).
9804@	2045 ⁱ	3.0 ⁱ	
9812@	2054g	2.3g	S(p, γ) eV: other: 6.2 for a level at Ep=2056 (2014Ka35).
9820@	2061 ⁱ	4.9 ⁱ	
9826@	2068g	1.5g	$\Gamma_{\gamma}=0.8$ eV (2008Vo08). S(p, γ) eV: other: 2.7 (2014Ka35).
9830@	2072g	1.2g	S(p, γ) eV: other: 1.9 for a level at Ep=2074 (2014Ka35).
9836@	2079g	1.3g	$\Gamma_{\gamma}=0.7$ eV (2008Vo08). S(p, γ) eV: other: 3.9 (2014Ka35).
9844@	2086 ⁱ	3.9 ⁱ	
9846@	2089g	2.3g	$\Gamma_{\gamma}=0.6$ eV (2008Vo08). S(p, γ) eV: other: 6.3 (2011Ka24), 7.7 (2014Ka35). E(p)(lab): other: 2090 (2011Ka24,2014Ka35).
9858@	2101g	1.5g	$\Gamma_{\gamma}=0.4$ eV (2008Vo08). S(p, γ) eV: other: 3.9 for a level at Ep=2100 (2014Ka35).
9863@	2106 ⁱ	3.4 ⁱ	
9868@	2111g	2.7g	$\Gamma_{\gamma}=1.4$ eV (2008Vo08).
9874@	2117 ⁱ	3.1 ⁱ	
9877@	2120 ⁱ	2.9 ⁱ	
9883@	2127g	0.8g	$\Gamma_{\gamma}=0.2$ eV (2008Vo08). S(p, γ) eV: other: 2.8 (2014Ka35).
9889@	2133 ⁱ	3.4 ⁱ	
9896@	2140 ⁱ	2.6 ⁱ	
9900@	2144g	1.3g	$\Gamma_{\gamma}=0.3$ eV (2008Vo08). S(p, γ) eV: other: 3.9 (2014Ka35).
9905@	2149 ⁱ	9.6 ⁱ	S(p, γ) eV: other: 7.8 (2011Ka24).
9918@	2163g	2.6g	S(p, γ) eV: other: 6.3 for a level at Ep=2169 (2014Ka35).
9937@	2182g	3.6g	S(p, γ) eV: other: 4.1 for a level at Ep=2180 (2014Ka35).
9942@	2187 ⁱ	1.1 ⁱ	
9946@	2191 ⁱ	4.7 ⁱ	
9952@	2197g	1.2g	S(p, γ) eV: other: 5.5 for a level at Ep=2200 (2014Ka35).
9955@	2201g	1.5g	S(p, γ) eV: other: 3.0 for a level at Ep=2205 (2014Ka35).
9960@	2206g	1.3g	$\Gamma_{\gamma}=0.7$ eV (2008Vo08). S(p, γ) eV: other: 6.5 for a level at Ep=2209 (2011Ka24), 8.2 for a level at Ep=2209 (2014Ka35).
9968@	2214g	1.4g	$\Gamma_{\gamma}=0.7$ eV (2008Vo08). S(p, γ) eV: other: 4.7 for a level at Ep=2220 (2011Ka24), 5.8 for a level at Ep=2220 (2014Ka35).
9979@	2225g	3.7g	$\Gamma_{\gamma}=1.9$ eV (2008Vo08). S(p, γ) eV: other: 2.5 for a level at Ep=2229 (2014Ka35).
9991@	2237g	1.5g	S(p, γ) eV: other: 1.9 for a level at Ep=2235 (2014Ka35).
9995@	2241g	1.3g	S(p, γ) eV: other: 4.8 for a level at Ep=2244 (2014Ka35).
10001@	2248g	0.7g	$\Gamma_{\gamma}=0.4$ eV (2008Vo08).
10009@	2255 ⁱ	6.7 ⁱ	S(p, γ) eV: other: 5.5 (2011Ka24).
10013@	2260g	1.4g	$\Gamma_{\gamma}=0.4$ eV (2008Vo08). S(p, γ) eV: other: 2.8 for a level at Ep=2259 (2014Ka35).
10019@	2266 ⁱ	2.2 ⁱ	
10026@	2273g	4.0g	$\Gamma_{\gamma}=2.0$ eV (2008Vo08). S(p, γ) eV: other: 5.5 (2014Ka35).
10034@	2281 ⁱ	2.2 ⁱ	
10046@	2293g	1.4g	$\Gamma_{\gamma}=0.4$ eV (2008Vo08). S(p, γ) eV: other: 4.3 for a level at Ep=2290 (2014Ka35).
10050@	2298 ⁱ	2.3 ⁱ	
10052@	2300g	1.4g	$\Gamma_{\gamma}=0.4$ eV (2008Vo08). S(p, γ) eV: other: 3.7 for a level at Ep=2301 (2014Ka35).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued)

 ^{41}K Levels (continued)

E(level) [†]	E(p)(lab)&	S(p, γ) eV ^f	Comments
10059@	2307 ⁱ	4.9 ⁱ	E(p)(lab),S(p, γ) eV: S=1.6 for a level at Ep=2312 (2008Vo03).
10068@	2316 ⁱ	4.4 ⁱ	E(p)(lab),S(p, γ) eV: S=1.6 for a level at Ep=2312 (2008Vo03).
10074@	2322 ^g	0.7 ^g	Γ_{γ} =0.35 eV (2008Vo08).
			S(p, γ) eV: other: 2.3 (2014Ka35).
10078@	2326 ⁱ	7.0 ⁱ	E(p)(lab),S(p, γ) eV: S=2.3 for a level at Ep=2330 (2008Vo03).
			S(p, γ) eV: other: 5.7 (2011Ka24).
10085@	2333 ⁱ	4.8 ⁱ	E(p)(lab),S(p, γ) eV: S=2.3 for a level at Ep=2330 (2008Vo03).
10091@	2339 ^g	2.9 ^g	E(p)(lab),S(p, γ) eV: S=4.1 for a level at Ep=2337 (2008Vo03).
10094@	2343 ⁱ	1.8 ⁱ	
10098@	2347 ^g	3.2 ^g	Γ_{γ} =1.6 eV (2008Vo08).
			E(p)(lab),S(p, γ) eV: S=4.2 for a level at Ep=2348 (2008Vo03).
10108@	2357 ^g	4.3 ^g	Γ_{γ} =2.2 eV (2008Vo08).
			E(p)(lab): other: 2360 (2011Ka24,2014Ka35).
			S(p, γ) eV: others: 6.8 (2011Ka24), 8.9 (2014Ka35).
10119@	2368 ^g	2.4 ^g	E(p)(lab),S(p, γ) eV: S=2.3 for a level at Ep=2369 (2008Vo03).
10128@	2377 ⁱ	11.7 ⁱ	E(p)(lab),S(p, γ) eV: S=1.3 for a level at Ep=2380 (2008Vo03).
			S(p, γ) eV: other: 9.3 (2011Ka24).
10133@	2382 ⁱ	2.9 ⁱ	E(p)(lab),S(p, γ) eV: S=1.3 for a level at Ep=2380 (2008Vo03).
10140@	2390 ⁱ	8.4 ⁱ	S(p, γ) eV: other: 6.8 (2011Ka24).
10146@	2396 ⁱ	4.4 ⁱ	
10150@	2400 ^g	3.8 ^g	Γ_{γ} =1.9 eV (2008Vo08).
			S(p, γ) eV: other: 4.5 (2014Ka35).
10159@	2409 ⁱ	4.9 ⁱ	
10164@	2414 ^g	2.0 ^g	Γ_{γ} =1.0 eV (2008Vo08).
			S(p, γ) eV: other: 7.7 for a level at Ep=2413 (2014Ka35).
10172@	2422 ^g	3.3 ^g	Γ_{γ} =1.7 eV (2008Vo08).
			E(p)(lab): others: 2421 (2011Ka24,2014Ka35).
			S(p, γ) eV: others: 11.4 (2011Ka24), 14.0 (2014Ka35).
10179@	2430 ⁱ	5.8 ⁱ	
10185@	2436 ^g	3.2 ^g	Γ_{γ} =1.6 eV (2008Vo08).
			S(p, γ) eV: other: 4.2 (2014Ka35).
10191@	2442 ⁱ	4.6 ⁱ	
10193@	2444 ^g	2.5 ^g	Γ_{γ} =0.6 eV (2008Vo08).
			S(p, γ) eV: other: 7.5 for a level at Ep=2445 (2014Ka35).
10198@	2449 ⁱ	1.7 ⁱ	
10207@	2458 ^g	2.2 ^g	Γ_{γ} =0.6 eV (2008Vo08).
			S(p, γ) eV: other: 5.6 for a level at Ep=2461 (2014Ka35).
10215@	2466 ^g	1.1 ^g	Γ_{γ} =0.6 eV (2008Vo08).
			S(p, γ) eV: other: 5.6 for a level at Ep=2467 (2014Ka35).
10220@	2472 ^g	4.0 ^g	Γ_{γ} =2.0 eV (2008Vo08).
			E(p)(lab): other: 2474 (2011Ka24,2014Ka35).
			S(p, γ) eV: other: 3.6 (2011Ka24), 7.5 (2014Ka35).
10228@	2480 ⁱ	5.3 ⁱ	
10234@	2486 ^g	11.6 ^g	Γ_{γ} =2.9 eV (2008Vo08).
			S(p, γ) eV: other: 4.2 (2014Ka35).
10248@	2500 ^g	2.6 ^g	Γ_{γ} =1.3 eV (2008Vo08).
			E(p)(lab): other: 2494 (2011Ka24,2014Ka35).
			S(p, γ) eV: other: 3.1 (2011Ka24), 7.5 (2014Ka35).
10257@	2509 ⁱ	6.7 ⁱ	
10261@	2513 ^g	2.5 ^g	Γ_{γ} =1.3 eV (2008Vo08).
			E(p)(lab),S(p, γ) eV: S=9.2 for level at Ep=2515 (2011Ka24), S=13.5 for level at Ep=2515 (2014Ka35).
10267@	2519 ^g	2.0 ^g	Γ_{γ} =1.0 eV (2008Vo08).
			E(p)(lab),S(p, γ) eV: S=9.2 for level at Ep=2515 (2011Ka24), S=3.9 for level at Ep=2523 (2014Ka35).
10276@	2529 ⁱ	1.5 ⁱ	
10281@	2535 ^g	3.0 ^g	Γ_{γ} =0.8 eV (2008Vo08).
			S(p, γ) eV: other: 1.1 (2014Ka35).
10285@	2539 ⁱ	2.1 ⁱ	
10295@	2549 ^g	5.0 ^g	Γ_{γ} =0.3 eV (2008Vo08).
			E(p)(lab): other: 2544 (2011Ka24, 2014Ka35).
			S(p, γ) eV: other: 5.9 (2011Ka24), 7.5 (2014Ka35).
10299@	2552 ⁱ	4.2 ⁱ	

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

$E(\text{level})^\dagger$	$E(\text{p})(\text{lab})^\&$	$S(\text{p},\gamma) \text{ eV}^f$	Comments
10315@	2569g	9.0g	$\Gamma_\gamma=0.5 \text{ eV}$ (2008Vo08). E(p)(lab): other: 2562 (2011Ka24,2014Ka35). S(p, γ) eV: other: 4.9 (2011Ka24), 6.0 (2014Ka35).
10325@	2580i	0.9i	
10330@	2584g	2.0g	$\Gamma_\gamma=0.5 \text{ eV}$ (2008Vo08). E(p)(lab),S(p, γ) eV: S=5.2 for level at Ep-2586 (2011Ka24), S=6.7 for level at Ep-2586 (2014Ka35).
10333@	2588g	1.4g	$\Gamma_\gamma=0.7 \text{ eV}$ (2008Vo08). E(p)(lab),S(p, γ) eV: S=5.2 for level at Ep-2586 (2011Ka24), S=6.7 for level at Ep-2586 (2014Ka35).
10339@	2594g	1.6g	$\Gamma_\gamma=0.8 \text{ eV}$ (2008Vo08).
10343@	2598i	2.7i	
10344@	2599i	5.3i	
10354@	2609g	4.5g	$\Gamma_\gamma=1.1 \text{ eV}$ (2008Vo08). S(p, γ) eV: other: 5.7 (2014Ka35).
10361@	2617g	1.6g	S(p, γ) eV: other: 5.3 (2014Ka35).
10372@	2627g	9.0g	S(p, γ) eV: others: 5.1 (2011Ka24), 6.2 (2014Ka35).
10376@	2631i	7.3i	S(p, γ) eV: other: 5.9 (2011Ka24).
10386@	2641i	13.1i	S(p, γ) eV: other: 8.3 (2011Ka24).
10391@	2646g	10.0g	
10397@	2653g	1.6g	
10403@	2659i	11.8i	E(p)(lab): other: 2661 (2008Vo03). S(p, γ) eV: other: 1.6 (2008Vo03).
10409@	2665i	6.2i	E(p)(lab): other: 2667 (2008Vo03). S(p, γ) eV: other: 1.4 (2008Vo03).
10417@	2673i	5.7i	
10421@	2677i	3.1i	
10429@	2686i	2.5i	
10440@	2698i	7.7i	S(p, γ) eV: other: 4.3 (2011Ka24).
10460@	2718i	5.2i	
10472@	2730i	3.5i	
10484@	2742i	1.7i	
10488@	2746i	5.0i	
10498@	2756i	12.6i	S(p, γ) eV: other: 14.0 (2011Ka24).
10514@	2773i	6.6i	
10528@	2787i	10.7i	
10538@	2797i	10.8i	
10550@	2810i	11.0i	S(p, γ) eV: other: 10.2 (2011Ka24).
10558@	2818i	11.0i	S(p, γ) eV: other: 7.2 (2011Ka24).
10566@	2826i	6.3i	
10574@	2835i	5.7i	
10604@	2866i	7.6i	
10614@	2876i	6.0i	
10623@	2884i	11.0i	S(p, γ) eV: other: 6.8 (2011Ka24).
10629@	2891i	5.4i	
10635@	2897i		
10642@	2905i		
10646@	2909i		
10655@	2918i		
10659@	2922i	11.8i	
10663@	2926h	7.0h	E(p)(lab): other: 2931 (2014Ka35).
10672@	2935i	11.2i	
10678@	2941i	8.6i	E(p)(lab): other: 2939 (2011Ka24). S(p, γ) eV: other: 6.8 (2011Ka24).
10682@	2945i	9.9i	E(p)(lab): other: 2949 (2011Ka24). S(p, γ) eV: other: 6.0 (2011Ka24).
10691@	2954i	5.1i	
10694@	2958i		

[†] From 1986Sm13 for bound levels, except where noted.[‡] From adopted levels for bound levels (up to 5402 keV) and from 1989Sm06 for levels (above 8 MeV) deduced from proton resonances, except where noted.[§] From DSAM. Values are from 1986Bi03, except where noted.

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) **^{41}K Levels (continued)**

According to adopted levels, there are two levels near this energy one depopulated by $633\gamma+647\gamma$ and the other by 1848γ .

@ Deduced from proton resonance. Excitation energy= $S(\text{p})+E(\text{p})(\text{c.m.})$, where $S(\text{p})=7808.619\ 5$ (2012Wa38).

& $E(\text{p})(\text{lab})$ in keV. The uncertainty in $E(\text{p})(\text{lab})$ is about the same as in the excitation energy.

a From 1963Ko22.

b From 1989Sm06.

c From 1967Bl26.

d From 1961Ar10.

e From 1963Co04.

f $(2J+1)\Gamma_{\text{p}}\Gamma_{\gamma}/\Gamma$, from 1989Sm06, except where noted.

g From 2008Vo08.

h From 2011Ka24.

i From 2014Ka35.

 $\gamma(^{41}\text{K})$

$\gamma\gamma$ coin information is from 1986Bi03.

Relative γ -ray intensities of resonances (1967Bl26)				
$E(\text{p})(\text{lab})$ keV	$I\gamma$	$E(\text{p})(\text{lab})$ keV	$I\gamma$	
1076.7	0.03	1140.0	0.09	
1082.3	0.12	1141.9	0.08	
1082.9	0.05	1146.9	0.05	
1086.5	0.43	1150.3	0.04	
1096.2 a	(0.04) a	1152.1	0.09	
1096.4 a	(0.04) a	1154.0	0.10	
1099.3	0.06	1159.7	0.04	
1101.8	1.00	1162.8	0.10	
1108.4	0.37	1165.6	0.02	
1113.5	0.04	1168.9	0.07	
1117.3	0.08	1172.8	0.03	
1117.9	0.10	1177.6	0.08	
1118.7	0.16	1179.2		
1119.8	0.07	1184.7	0.06	
1130.5	0.01	1186.3	0.07	
1137.1	0.02	1194.0	0.07	
1138.7	0.03	1195.7	0.05	
a: unresolved doublet				

$E(\text{level})$	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult.	δ	Comments
980.51	980.5	100			
1293.66	1293.6	100			
1559.92	579.4	16.0 10			
	1559.9	84.0 10			
1582.10	288.4@				
	601.6	14.4 8			
	1582.1	85.6 8			
1592.99	612.5	36.5 13			
	1593.0	63.5 13			
1677.1	383.4 ^e	<7			
	696.6 ^e	<4			
	1677.1	100			
1698.00	404.3 ^e	<4			
	717.5 ^e	<3			
	1698.0	100			
2143.8	445.8@				
	466.7 ^e	<5			
	550.8 ^e	<4			
	561.7 ^e	<3			
	583.9	25 5			
	1163.3	4.4 10			γ not seen in (n, γ).
	2143.7	70 4			
2166.73	489.6 ^e	<7			
	573.7	<15			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
2166.73	584.6	6.2 7			I γ : other: 20 8 (1971Pi12). In 1986Sm13, the intensity in may have been influenced by a 584 line in background.
	606.8@				
	873.1 ^e	<10			
	1186.2	53.7 18			
	2166.7	40.1 16			
2316.8	639.7 ^e	<8			
	734.7 ^e	<9			
	1023.1	100			
	1336.3 ^e	<7			
2440.1	742.1@				
	763.0 ^e	<6&			
	847.1@				
	858.0 ^e	<5			
	880.2	8.5 23			
	1146.4 ^e	<6			
	1459.6@				
	2440.0	91.5 23			
2494.6	817.5@				
2507.9	809.9 ^e	<7			
	830.8	48.7 12			
	925.8 ^e	<7			
	948.0	8.6 6			
	1214.2	10.9 6			
	1527.4 ^e	<7			
	2507.8	31.8 12			
2527	849.9@				
2593.38	895.4 ^e	<1 ^a			
	916.3 ^e	<1			
	1000.4 ^e	<3			
	1011.3	88 2			
	1033.4 ^e	<1.5			
	1612.8 ^e	<1			
	2593.3	12 2			
2674.3	997.2 ^e	<8			
	1081.3 ^e	<4			
	1092.2 ^e	<9			
	1114.4 ^e	<15&			
	1380.6 ^e	<13			
	1693.8@				
	2674.2	17 5			
2710.3	566.5@				
	1117.3@				
	1729.8@				
2712.4	395.6@				
	1014.4@	20 20			I γ : from 1971Pi12.
	1130.3	26 8			
	1418.7	74 8			
	612.4	15 8			
2756.2	1058.2	12 3			
	1079.1	4 1			
	1196.3	11 3			
	2756.1	58 7			
3047.0	453.6@				
	1454.0	18 6			
	1464.9@				
	2066.4 ^e	&			
	3046.9	82 6			
3141.3	633.4@				
	646.7@				
	1847.6	60 20			
3179.8	1619.8	24 5			
	3179.7	76 5			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
3213.2	1919.5	100			
3229.8	1669.8	45 12			
	2249.2	33 8			
	3229.7	22 8			
3235.6	918.8	18 6			
	1941.9	82 6			
3277.9	3277.8	100			
3450.1	1752.1 ^e	<4			
	1857.1 ^e	<5			
	2156.4	100			
	2469.5 ^e	<4			
	3449.9 ^e	<2			I γ : other: <5 (1971Pi12). 58% given by 1970Ko28 is probably due to a line from background.
3488.5	1790.5	9.6 15			
	1811.4 ^e	<2			
	1895.5	3.2 10			
	1906.4 ^e	<3			
	1928.5 ^e	<5			
	2194.8	3.0 10			
	2507.9	5.2 12			
	3488.3	79 6			
3571.9	1894.8 [@]				
3579.2	1435.4 [@]				
	2019.2 [@]				
	3579.0	100			
3614.8	2021.8	16 4			
	2032.6	29 5			
	3614.6	55 9			
3626.1	2043.9	50 10			
3740.1	2157.9	50 10			
	3739.9	50 10			
3761.54	1005.3	5 2			
	1266.9 ^e	<3 ^a			
	2063.5	7 2			
	2084.4 ^e	<5			
	2179.4 ^e	<2			
	2201.6	17 4			
	2780.9 ^e	<6			
	3761.4	71 10			
3774.3	2192.1	15 5			
	2480.6	55 10			
	2793.7 ^e	a			
	3774.1	30 10			
3861.3	2301.3	42 4			I γ (2301)/I γ (3861)=24 8/76 8 (1971Pi12).
	2880.7	7 2			
	3861.1	51 4			
3911.7	2931.1	80 6			
	3911.5	20 6			
4026.7	1709.9	40 7			
	2732.9	60 7			
4164.7	2466.6	25 8			
	2487.5	75 8			
4340.9	4340.7	100			
4674	4674 ^d	100 ^d			
4745.2	2250.5 ^e	a			
	2428.3	8 3			
	2578.4	27 7			
	3047.1	28 5			
	3068.0 ^e	a			
	3163.0	17 6			
	4744.9	20 6			
4848.5	2704.6	38 10			
	4848.2	62 10			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
4962.3	4962.0	100			
5101.2	2784.3	55 15			
	5100.9	45 15			
5401.7	3084.8	16 5			
	5401.3	84 5			
8758.5	5018.1	9.6			
	5528.3	8.7			
	6045.6	6.4			
	6164.6	6.1			
	6317.9	9.6			
	6591.2	8.0			
	7164.8	6.4			
	7175.7	19			
	7197.9	19			
	7777.2	3.4			
	8757.5	3.8			
8770.1	3807.6	2.2			
	3921.4	0.6			
	4743.1	5.0			
	4908.5	2.8			
	5143.7	3.3			
	5155.0	2.8			
	5539.9	4.2			
	5722.7	1.2			
	6095.3	10			
	6176.2	2.2			
	6329.5	3.2			
	6452.8	5.4			
	6602.8	4.4			
	7071.4	1.6			
	7176.4	15			
	7187.3	6.1			
	7788.8	18			
	8769.1	12			
8789.6	5163.2	6.3			
	5576.0	15			
	6076.7	17			
	6349.0	6.3			
	6622.3	6.6			
	7090.9	9.7			
	7229.0	27			
	7808.3	5.5			
	8788.6	6.6			
8851.4	4106.0	7.7			
	5236.2	14			
	5621.2	10			
	6257.5	5.0			
	6684.1	9.2			
	7268.6	4.6			
	7870.1	4.5			
	8850.4	45			
8864.5	3763.1	2.1			
	5002.9	6.6			
	5284.9	1.3			
	5586.2	1.3			
	5817.1	2.5			
	6151.6	2.1			
	6697.2	6.0			
	7270.8	12			
	7281.7	7.0			
	7303.9	45			
	7570.1	2.1			
	7883.2	12			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
8868.6	3466.7	1.6			
	4841.6	2.9			
	5242.1	6.0			I γ : other: 9 (1971Pi12).
	5379.7	1.7			
	5590.3	1.8			
	5821.2	2.6			I γ : other: 5 (1971Pi12).
	6155.7	1.1			
	6274.7	18			I γ : other: 20 (1971Pi12). $A_2=-0.67$ 8 $A_4=+0.18$ 10.
	6551.2	2.8			I γ : other: 4 (1971Pi12).
	6701.3	1.2			I γ : other: 3 (1971Pi12).
	7285.8	21			I γ : other: 16 (1971Pi12). $A_2=+0.14$ 8 $A_4=-0.09$ 9.
	7887.3	3.3			I γ : other: 5 (1971Pi12).
	8867.6	36			I γ : other: 38 (1971Pi12). $A_2=+0.36$ 6 $A_4=+0.03$ 7.
8882.7	3480.8	2.1			
	3920.2	1.0			
	4137.3	1.9			
	4541.6 ^d	3 ^d			I γ : branch from 1971Pi12 only.
	4855.7	2.3			
	5021.1	5.7			I γ : others: 8 (1971Pi12), 18 (1964Ar13).
	5108.1	2.3			I γ : other: 2 (1971Pi12).
	5256.2	2.0			I γ : other: 3 (2008Vo03).
	5432.2	13			I γ : others: 14 (1971Pi12), 16 (2008Vo03). $A_2=-0.02$ 5 $A_4=-0.03$ 6 (1989Sm06).
	5604.4	1.8			
	5669.1	1.7			I γ : other: 2 (2008Vo03).
	5702.5	0.9			
	6126.0	1.4			I γ : other: 2 (2008Vo03).
	6169.8	1.3			I γ : other: 2 (2008Vo03).
	6207.9	1.8			I γ : other: 2 (2008Vo03).
	6288.8	23			I γ : others: 28 (1971Pi12), 29 (2008Vo03). $A_2=-0.41$ 2 $A_4=+0.03$ 3 (1989Sm06).
	6715.4	1.7			I γ : other: 3 (1971Pi12).
	7184.0	0.7			I γ : other: 1 (1971Pi12).
	7299.9	29			I γ : others: 34 (1971Pi12), 36 (2008Vo03). $A_2=+0.27$ 2 $A_4=-0.11$ 2 (1989Sm06). $\Gamma_{\gamma}=2.3$ eV 5 (1971Ko32).
	7588.3 ^e	3			I γ : from 1964Ar13 only.
	7901.4	5.6			I γ : others: 6 (1971Pi12), 7 (2008Vo03). $A_2=-0.33$ 7 $A_4=-0.12$ 8 (1989Sm06).
	8881.7	0.8			I γ : others: 1 (1971Pi12), 1 (2008Vo03). $A_2=+0.35$ 6 $A_4=+0.05$ 18 (1989Sm06).
8889.8	3487.9	1.7			
	4548.6	1.5			I γ : other: <3 (1971Pi12).
	5115.2	1.5			
	5310.2 ^{de}	<3 ^d			I γ : branch from 1971Pi12 only.
	5439.3	5.0			I γ : other: 6 (1971Pi12). $A_2=+0.02$ 24 $A_4=+0.11$ 31 (1989Sm06).
	5653.8	1.5			
	5709.6	5.2			
	6133.1	2.5			
	6176.9	2.9			
	6295.9	15			I γ : other: 20 (1971Pi12). $A_2=-0.49$ 9 $A_4=-0.06$ 11 (1989Sm06).
	6745.4	1.7			
	7191.4 ^d	3 ^d			I γ : branch from 1971Pi12 only.
	7307.0	14			I γ : other: 8 (1971Pi12). $A_2=+0.12$ 10 $A_4=-0.03$ 12 (1989Sm06).
	7595.4 ^e	2			I γ : branch from 1964Ar13 only.
	7908.5	7.5			I γ : other: 9 (1971Pi12).

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
8889.8	8888.8	40			I γ : other: 43 (1971Pi12). A ₂ =+0.56 5 A ₄ =-0.13 7 (1989Sm06).
8899.4	5037.8	9 $\frac{5}{2}$			I γ : branch not reported by 1971Pi12.
	5319.8 ^d	9 ^d			I γ : other: 7 (1964Ar13).
	5669.2	7 $\frac{5}{2}$			I γ : branch not reported by 1971Pi12.
	6305.5 ^d	6 ^d			I γ : other: 11 (1964Ar13).
	6732.4 ^d	34 ^d			I γ : other: 15 (1964Ar13).
	7316.6 ^d	33 ^d			I γ : other: 27 (1964Ar13).
	7605.0	3 $\frac{5}{2}$			I γ : branch not reported by 1971Pi12.
	7918.1 ^d	7 ^d			I γ : other: 11 (1964Ar13).
	8898.4 ^d	11 ^d			I γ : other: 11 (1964Ar13).
8942.4	4915.4	7.5			
	6185.7	13			
	6348.5	4.8			
	6625.0	22			
	6775.1	7.3			
	6798.0	13			
	7381.8	14			
	7961.1	12			
	8941.4	6.4			
8958.7	4931.7	4.5			
	5343.5	7.4			
	6283.9	15			
	6791.4	2.7			
	6814.3	3.3			
	7260.0	4.7			
	7365.0	14			
	7375.9	20			
	7398.1	7.9			
	7977.4	16			
	8957.6	4.5			
9018.8	5278.3	1.6			
	5392.3	1.1			
	6305.9	1.2			
	6344.0	5.2			
	6578.1	2.2			
	6851.5	2.5			
	7425.1	1.3			
	7436.0	1.8			
	7458.2	1.1			
	8037.4	38			A ₂ =-0.06 27 A ₄ =-0.15 34 (1989Sm06).
	9017.7	44			A ₂ =-0.13 26 A ₄ =-0.03 32 (1989Sm06).
9022.5	5282.0	5.3			
	5786.5	4.5			
	5975.0	7.6			
	6265.8	4.8			
	6705.1	4.5			
	6878.1	14			
	7439.7	5.3			
	7728.1	40			
	8041.1	14			
9070.8	4905.8	2.6			
	5890.5	5.6			
	6023.3	0.9			
	6357.9	8.0			
	6903.4	7.5			
	7477.1	21			
	7488.0	6.6			
	7510.1	6.6			
	7776.3	26			
	8089.4	3.2			
	9069.7	12			
9081.3	4335.9	1.3			

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
9081.3	5169.3	3.1			
	5466.1	3.2			
	5851.1	2.8			
	6033.8	2.1			
	6324.6	2.1			
	6487.4	5.5			
	7487.6	4.4			
	7498.5	9.0			
	7520.6	26			$A_2=+0.25$ 8 $A_4=+0.04$ 11 (1989Sm06).
	7786.8	1.5			
	8099.9	16			$A_2=-0.06$ 12 $A_4=-0.11$ 15 (1989Sm06).
	9080.2	23			$A_2=-0.12$ 10 $A_4=+0.11$ 13 (1989Sm06).
	9099.2	4.2			
	6781.8	11			
9099.2	6931.8	5.8			
	6954.8	6.8			
	7400.5	14			
	7505.5	16			
	7538.5	23			
	7804.7	4.1			
	8117.8	4.1			
	9098.1	11			
	5882.2	3.6			
	5932.2	4.4			
	6065.0	2.8			
	6355.8	2.3			
	6671.8	2.9			
	6795.1	2.5			
9112.5	6945.1	3.9			
	6968.1	4.6			
	7434.7	1.8			
	7529.7	8.8			
	7551.8	22			
	7818.0	2.4			
	8131.1	11			
	9111.4	27			
	5523.2	7.2			
	6425.5	5.1			
	6697.7	10			
	6971.0	4.3			
	6994.0	10			
	7439.7	4.8			
9138.4	7544.7	15			
	7555.6	4.6			
	7577.7	14			
	8157.0	13			
	9137.3	12			
	7584.1	19			
	8163.4	44			
	9143.7	37			
	6391.4	10			
	6435.2	18			
	6554.2	7.1			
	6830.7	5.9			
	7003.7	30			
	7449.4	5.0			
9148.1	8166.7	11			
	9147.0	13			
	5928.0	1.7			
	6840.9	7.6			
	6990.9	19			
	8176.9	5.7			
	9157.2	66			
	5928.0	1.7			
	6840.9	7.6			
	6990.9	19			
	8176.9	5.7			
	9157.2	66			
	5928.0	1.7			
	6840.9	7.6			
	6990.9	19			
	8176.9	5.7			
9158.3	9157.2	66			
	5928.0	1.7			
	6840.9	7.6			
	6990.9	19			
	8176.9	5.7			
	9157.2	66			
	5928.0	1.7			
	6840.9	7.6			
	6990.9	19			
	8176.9	5.7			
	9157.2	66			
	5928.0	1.7			
	6840.9	7.6			
	6990.9	19			
	8176.9	5.7			

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
9163.3	5136.3	6.1			
	5301.6	17			
	5388.6	5.4			
	5983.0	8.8			
	6406.6	34			
	6722.6	1.0			
	6845.9	2.2			
	6995.9	2.4			
	7018.9	1.7			
	7464.6	3.6			
	7580.4	3.1			
	7602.6	4.6			
	8181.9	2.3			
	9162.2	7.8			
9167.7	5427.2	5.1			
	5889.3	2.5			
	6411.0	11			
	6454.8	14			
	6727.0	12			
	6850.3	5.0			
	7000.3	2.9			
	7023.3	8.5			
	7469.0	10			
	7574.0	5.2			
	7584.8	10			
	7607.0	7.7			
	9166.6	6.1			
9183.7	5322.0	3.6			
	5947.6	6.6			
	6508.8	9.6			
	6743.0	3.7			
	6866.3	4.8			
	7016.3	3.0			
	7485.0	1.5			
	7505.9	1.5			
	7590.0	16			
	7623.0	2.5			
	7889.2	1.4			
	8202.3	4.8			
	9182.6	41			
9195.3	5283.2	3.8			
	5568.8	3.0			
	6147.8	12			
	7027.9	8.4			
	7601.6	3.6			
	7634.6	8.2			
	8213.9	42			
	9194.2	19			
9200.2	5288.1	1.3			
	5573.7	2.9			
	5585.0	2.3			
	5921.8	3.3			
	6487.2	6.4			
	6525.3	4.6			
	6759.5	13			
	6882.8	2.6			
	7032.8	3.7			
	7055.7	2.6			
	7501.5	1.7			
	7522.4	4.5			
	7606.5	17			
	7639.5	26			
	9199.1	8.1			

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$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
9202.8	5576.3	2.1			
	6446.1	4.2			
	6489.8	5.0			
	6527.9	5.4			
	7035.4	0.9			
	7058.3	1.4			
	7504.1	6.2			
	7609.1	30			
	8221.4	41			
	9201.7	3.8			
9209.0	7041.6	25			
	7615.3	11			
	7626.1	13			
	7648.3	31			
9219.6	9207.9	20			
	4257.1	5.2			
	5593.1	3.0			
	6039.3	1.9			
	6172.1	1.3			
	6462.9	1.0			
	6902.2	1.8			
	7075.1	9.4			
	7520.9	8.4			
	7636.7	28			
	8238.2	17			
	9218.5	23			
9226.4	4480.9	3.2			
	5314.3	5.4			
	5364.7	1.6			
	5599.9	5.7			
	5611.2	6.9			
	5948.0	2.2			
	5996.1	2.1			
	6178.9	1.6			
	6632.4	6.3			
	6785.7	7.4			
	7059.0	8.6			
	7527.7	2.7			
	7632.6	3.1			
	7643.5	11			
	7665.7	11			
	8245.0	8.2			
9232.0	9225.3	13			
	5370.3	1.4			
	5491.5	4.7			
	5605.5	2.7			
	5781.5	1.6			
	5953.6	1.8			
	6001.7	3.4			
	6051.7	3.4			
	6184.5	0.9			
	6519.0	4.6			
	6557.1	3.1			
	6791.3	12			
	6914.6	2.3			
	7087.5	3.4			
	7533.3	1.1			
	7638.2	1.8			
	7649.1	20			
9262.5	7671.3	5.4			
	8250.6	5.4			
	9230.9	21			
	5400.8	7.2			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
9262.5	6032.2	5.7			
	6505.7	6.0			
	6668.5	4.7			
	7563.8	4.7			
	7668.7	18			
	7679.6	12			
	7701.8	6.7			
	8281.1	15			
	9261.4	20			
9270.7	6513.9	3.4			
	6557.7	13			
	6595.8	4.7			
	6676.7	2.9			
	6953.3	14			
	7103.3	21			
	7571.9	9.1			
	7676.9	3.7			
	7687.8	2.9			
	7710.0	1.3			
	8289.3	8.0			
	9269.6	16			
9281.0	5419.3	9.8			
	6524.2	6.0			
	6568.0	5.5			
	6606.1	9.8			
	6840.3	4.1			
	6963.6	11			
	7113.6	11			
	7582.2	7.6			
	7720.3	20			
	7986.5	3.6			
	8299.6	4.6			
	9279.9	7.0			
9284.7	6527.9	3.7			
	6571.7	5.6			
	6609.8	4.1			
	6967.3	2.4			
	7140.2	4.1			
	7585.9	1.2			
	7606.8	2.3			
	7701.8	7.6			
	8303.3	25			
	9283.6	44			
9290.7	5429.0	3.0			
	5711.1	3.4			
	6243.2	4.8			
	6533.9	1.0			
	6577.7	4.7			
	6615.8	2.5			
	6696.7	3.6			
	6850.0	3.6			
	7123.3	2.6			
	7146.2	2.5			
	7696.9	25			
	7730.0	12			
	8309.3	3.3			
	9289.6	28			
9361.0	5910.4				E_{γ} : from 1971Ko32.
	6147.3	2.6			
	6313.5	2.2			
	6648.0	8.1			
	6686.1	4.6			
	6767.0	2.2			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p},\gamma)$ 1989Sm06,1986Sm13,1986Bi03 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult.	δ	Comments
9361.0	7193.6	3.4			
	7683.1	6.0			
	7778.1	11			
	8066.5	13			
	8379.6	19			
	9359.9	28			
9374.2	4700 ^d	6 ^d			
	5612.4 ^d	15 ^d			
	5885.3 ^d	22 ^d			1971Ko32 show the most intense transition to 3450 level, not to the 3488 level as in 1971Pi12.
	5924 [#]				$\Gamma_{\gamma}=2.3$ eV 5 (1971Ko32).
	6194.0 ^d	8 ^d			
	6661.4 ^d	8 ^d			
	6780.4 ^d	3 ^d			
	6933.7 ^{de}	<3 ^d			
	7056.9 ^d	3 ^d			
	7229.9 ^d	4 ^d			
	7791.5 ^d	5 ^d			
	7813.7 ^d	8 ^d			
	8079.8 ^{de}	<2 ^d			
	8393.0 ^d	7 ^d			
	9373.1 ^d	11 ^d			
9602	6152 ^b	3 ^c			
	6422 ^b	6 ^c			
	6460 ^b	7 ^c			
	6846 ^b	1 ^c			
	6890 ^b	3 ^c			
	6892 ^b	3 ^c			
	7162 ^b	8 ^c			
	7286 ^b	3 ^c			
	7435 ^b	5 ^c			
	7458 ^b	9 ^c			
	7903 ^b	4 ^c			
	8009 ^b	2 ^c			
	8020 ^b	3 ^c			
	8042 ^b	5 ^c	E1 (+M2)	0.4 4	Mult., δ : $A_2=-0.4$ 7, $A_4=0.3$ 8 (2008Vo03).
	8308 ^b	10 ^c	E2+M3	0.52 24	Mult., δ : $A_2=0.16$ 26, $A_4=0.15$ 30 (2008Vo03).
	8622 ^b	3 ^c	E1+M2	0.58 15	Mult., δ : $A_2=-0.72$ 23, $A_4=0.6$ 3 (2008Vo03).
	9602 ^b	25 ^c	E1+M2	0.14 12	Mult., δ : $A_2=0.08$ 13, $A_4=0.03$ 12 (2008Vo03).
9605	6155 ^b	5 ^c			
	6392 ^b	1 ^c			
	6557 ^b	2 ^c			
	7289 ^b	10 ^c			
	7438 ^b	14 ^c			
	7461 ^b	7 ^c			
	8012 ^b	3 ^c			
	8023 ^b	4 ^c			
	8045 ^b	4 ^c	E1+M2	-2.4 22	Mult., δ : $A_2=0.4$ 5, $A_4=-0.6$ 5 (2008Vo03).
	8625 ^b	12 ^c	E1+M2	0.58 15	Mult., δ : $A_2=-0.72$ 23, $A_4=0.6$ 3 (2008Vo03).
	9605 ^b	38 ^c			
9622	5971 ^b	12 ^c			
	7182 ^b	11 ^c			
	7923 ^b	15 ^c			
	8040 ^b	8 ^c			
	8062 ^b	22 ^c			
	8328 ^b	8 ^c			
	8642 ^b	9 ^c			
	9622 ^b	15 ^c			
9632	7465 ^b	46 ^c			$\Gamma_{\gamma}=4.6$ eV 7 (1971Ko32).
	7933 ^b	14 ^c			
	8039 ^b	4 ^c			
	8050 ^b	3 ^c			
	8072 ^b	4 ^c			

Continued on next page (footnotes at end of table)

⁴⁰Ar(p,γ) 1989Sm06,1986Sm13,1986Bi03 (continued)

γ(⁴¹K) (continued)

E(level)	E _γ [†]	I _γ [‡]	Mult.	δ	Comments
9632	8337 ^b	3 ^c			Γ _γ =2.3 eV 5 (1971Ko32).
	8652 ^b	15 ^c	E1+M2	1.0 6	Mult.,δ: A ₂ =-0.5 20, A ₄ =0.24 24 (2008Vo03).
	9632 ^b	11 ^c	E1+M2	-0.18 23	Γ _γ =6.4 eV 7 (1971Ko32).
					Mult.,δ: A ₂ =0.04 20, A ₄ =-0.3 3 (2008Vo03).
9658	6948 ^b	4.6 ^c			
	7342 ^b	8.3 ^c			
	7514 ^b	3.0 ^c			
	8076 ^b	11.2 ^c	E1(+M2)	-5 10	Mult.,δ: A ₂ =0.2 4, A ₄ =0.0 5 (2008Vo03).
	8098 ^b	3.8 ^c			
	8678 ^b	52.6 ^c	E1(+M2)	0.0 5	Mult.,δ: A ₂ =-0.2 8, A ₄ =-0.1 9 (2008Vo03).
	9658 ^b	16.5 ^c	E1+M2	-2.0 12	Mult.,δ: A ₂ =0.36 19, A ₄ =0.16 19 (2008Vo03).

[†] Level-energy differences with recoil removed. The level schemes are essentially from 1989Sm06 for resonances and 1986Sm13 for bound levels.

[‡] From 1986Sm13 and 1989Sm06.

§ Branching ratios from 1118 resonance are reported by 1964Ar13 and 1971Pi12. There are four resonances reported by 1967Bl26 close to 1118 keV: 1117.3, 1117.9, 1118.7 and 1119.8 keV. The branchings reported by 1964Ar13 and 1971Pi12 are arbitrarily assigned (evaluators) to 1118.7 resonance since it is the most intense of all the four. But in principle the γ rays could be associated with any or all of the four resonances.

Transition from 1971Ko32.

@ Transition from level scheme of 1986Bi03.

& Large branch reported in (p,p'γ) (1986St10) is thought to be from background.

^a Large branch in (n,γ), but either very weak or absent in (p,γ).

^b From 2008Vo03. E_γ is from level energy difference.

^c From 2008Vo03.

^d From 1971Pi12.

^e Placement of transition in the level scheme is uncertain.

⁴⁰Ar(p,p),(p,α),(p,n): Res 1966Ke09,1968Sc11,1972Bu06

1966Ke09 (also 1966Ke01): ⁴⁰Ar(p,p),(p,α) with E(p)=1.63–2.60 MeV and ⁴⁰Ar(p,n) with E(p)=2.34–2.60 MeV. Measured σ at 135° using solid state detector (FWHM=250 eV) for many proton resonances. Deduced J_π, L, Γ, Γ_p, Γ_α, Γ_n of about 120 resonances from E(p)(lab)=1643–2602. Almost all single (p,p) resonances near 1870 and 2450 were interpreted as fine structure of the fourth (J_π=3/2+) and sixth (J_π=1/2+) excited states of ⁴¹Ar.

2014Ka35: ⁴⁰Ar(p,p') with E(p)=1.0–3.0 MeV. Measured σ using a NaI(Tl) detector.

1972Bu06 (also 1971BuZM): ⁴⁰Ar(p,p') with E(p)=3.35–5.30 MeV. Measured σ, σ(θ) using silicon surface-barrier detectors. A total of 23 resonances reported from E(p)(lab)=3390 to 5330 keV.

1968Sc11: ⁴⁰Ar(p,p),(p,α) with E(p)=1.81–4.35 MeV. Measured cross sections and σ(θ) using four silicon surface-barrier detectors (FWHM=3 keV). A total of 27 prominent resonances were seen and 17 resonances were analyzed from E(p)(lab)=1888 to 4070 keV. Deduced Γ parameters and spectroscopic factors.

1968Yo05: ⁴⁰Ar(p,n) with E(p)=2.3–5.0 MeV. Measured neutrons by tof method (FWHM=5 keV); deduced proton resonances. A total of 37 resonances were reported from E(p)(lab)=2440 to 4960 keV.

1967Br08: ⁴⁰Ar(p,p) with E=1.87 MeV. Measured proton polarization of 12 resonances from 1830 to 1960 using two scintillation detectors.

1967Sl05: ⁴⁰Ar(p,p),(p,p'),(p,α) with E(p)=3.5–6.0 MeV. Measured cross sections and σ(θ) using two surface-barrier detectors. Deduced level widths.

1967Bl26: ⁴⁰Ar(p,p) with E(p)=1.1 MeV. Measured σ(θ) for 1086, 1102 and 1108 resonances using four surface barrier detectors.

1966Sk02: ⁴⁰Ar(p,p'γ) with E(p)=2.5–5 MeV. Deduced 9 resonances.

1963Co04: two resonances seen at 1875 8 and 1890 8.

⁴¹K Levels

Γ_p, Γ_α, Γ_n from 1996Ke09 are given under comments. When two values are given, they refer to two J_π choices.

E(level) [†]	J _π ^d	Γ ^c	E(p)(lab) [‡]	S ^g	Comments
8868.6	3/2- ^a	7.9 eV ^a 19	1086.5 ^a		Γ _p /Γ=0.49 16, Γ _α =0.032 12 eV (1967Bl26).
8883.5	3/2- ^a	21.9 eV ^a 25	1101.8 ^a		Γ _p /Γ=0.58 8, Γ _α =0.064 24 eV (1967Bl26).
					E(p)(lab): other: 1102 (2014Ka35).

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$^{40}\text{Ar}(\text{p},\text{p}),(\text{p},\alpha),(\text{p},\text{n})$: Res 1966Ke09,1968Sc11,1972Bu06 (continued) **^{41}K Levels (continued)**

E(level) [†]	J π^{d}	Γ^{c}	E(p)(lab) [‡]	S ^g	Comments
8890.0	3/2 ^{-a}	5.1 eV ^a	1108.4 ^a		$\Gamma_{\text{p}}/\Gamma=0.70$ 15, $\Gamma_{\alpha}=0.019$ 6 eV (1967Bl26). E(p)(lab): other: 1108 (2014Ka35).
8900			1119 ^h		
8920			1139 ^h		
8933			1153 ^h		
8941			1161 ^h		
8949			1169 ^h		
8958			1178 ^h		
8964			1184 ^h		
8973			1193 ^h		
8977			1198 ^h		
8983			1204 ^h		
8987			1208 ^h		
8997			1218 ^h		
9007			1228 ^h		
9017			1239 ^h		
9020			1242 ^h		
9028			1250 ^h		
9033			1255 ^h		
9037			1259 ^h		
9044			1266 ^h		
9057			1280 ^h		
9068			1291 ^h		
9078			1301 ^h		
9095			1319 ^h		
9109			1333 ^h		
9113			1337 ^h		
9122			1346 ^h		
9128			1352 ^h		
9133			1357 ^h		
9142			1367 ^h		
9160			1385 ^h		
9170			1395 ^h		
9177			1403 ^h		
9195			1421 ^h		
9201			1427 ^h		
9267			1495 ^h		
9271			1499 ^h		
9274			1502 ^h		
9280			1508 ^h		
9286			1514 ^h		
9314			1543 ^h		
9329			1558 ^h		
9339			1569 ^h		
9356			1586 ^h		
9360			1590 ^h		
9367			1597 ^h		
9379			1610 ^h		
9411.7	1/2 ⁺	20 eV	1643.2		$\Gamma_{\text{p}}=20$ eV. E(p)(lab): other: 1646 (2014Ka35).
9417.3	3/2 ⁻	6 eV	1648.9		$\Gamma_{\text{p}}=5$ eV, $\Gamma_{\alpha}=1$ eV. E(p)(lab): other: 1651 (2014Ka35).
9424.3	3/2 ⁻	35 eV	1656.1		$\Gamma_{\text{p}}=35$ eV, $\Gamma_{\alpha}=1$ eV.
9430			1662 ^h		
9439.1	3/2 ⁻	25 eV	1671.1		$\Gamma_{\text{p}}=25$ eV. E(p)(lab): other: 1672 (2014Ka35).
9444.6	1/2 ⁻ , 3/2 ⁻	40 eV	1676.9		Γ : for 1/2 ⁻ ; 20 eV for 3/2 ⁻ . $\Gamma_{\text{p}}=40,20$ eV. E(p)(lab): other: 1676 (2014Ka35).
9452			1684 ^h		
9461			1694 ^h		

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$^{40}\text{Ar}(\text{p,p}),(\text{p},\alpha),(\text{p},\text{n})$: Res 1966Ke09,1968Sc11,1972Bu06 (continued) **^{41}K Levels (continued)**

E(level) [†]	J π^d	Γ^c	E(p)(lab) [‡]	S g	Comments
9471.1	1/2-, 3/2-	25 eV	1704.0		Γ : for 1/2-; 15 eV for 3/2-. $\Gamma_p=25,15$ eV. E(p)(lab): other: 1703 (2014Ka35).
9477.1	1/2-	100 eV	1710.2		$\Gamma_p=100$ eV. E(p)(lab): other: 1711 (2014Ka35).
9481.8	1/2-, 3/2-	50 eV	1715.0		Γ : for 1/2-; 35 eV for 3/2-. $\Gamma_p=50,35$ eV. E(p)(lab): other: 1716 (2014Ka35).
9497.4	1/2-, 3/2-	32 eV	1731.0		Γ : for 1/2-; 21 eV for 3/2-. $\Gamma_p=30,20$ eV, $\Gamma_\alpha=2,1$ eV. E(p)(lab): other: 1731 (2014Ka35).
9499.5	3/2-	60 eV	1733.2		$\Gamma_p=60$ eV. E(p)(lab): other: 1737 (2014Ka35).
9512.1	1/2-, 3/2-	80 eV	1746.1		Γ : for 1/2-; 50 eV for 3/2-. $\Gamma_p=80,50$ eV. E(p)(lab): other: 1745 (2014Ka35).
9514.5	1/2-	75 eV	1748.5		$\Gamma_p=70$ eV, $\Gamma_\alpha=5$ eV.
9531.9	3/2-	20 eV	1766.4		$\Gamma_p=20$ eV. E(p)(lab): other: 1766 (2014Ka35).
9538.2	1/2-	34 eV	1772.8		$\Gamma_p=30$ eV, $\Gamma_\alpha=4$ eV. E(p)(lab): other: 1774 (2014Ka35).
9551			1786 ^h		
9560.4	3/2-	100 eV	1795.6		$\Gamma_p=100$ eV, $\Gamma_\alpha=1$ eV.
9567			1802 ^h		
9571.7	1/2-	50 eV	1807.2		$\Gamma_p=50$ eV. E(p)(lab): other: 1809 (2014Ka35).
9575.3	3/2-	40 eV	1810.8		$\Gamma_p=40$ eV, $\Gamma_\alpha=1$ eV.
9579.1	3/2-	150 eV	1814.7		$\Gamma_p=150$ eV, $\Gamma_\alpha=1$ eV. E(p)(lab): other: 1817 (2014Ka35).
9586.1	1/2-, 3/2-	23 eV	1821.9		Γ : for 1/2-; 12 eV for 3/2-. $\Gamma_p=18,10$ eV, $\Gamma_\alpha=5,2$ eV.
9589			1825 ^h		
9593.4	1/2-, 3/2-	60 eV	1829.4		Γ : for 1/2-; 40 eV for 3/2-. $\Gamma_p=60,40$ eV. E(p)(lab): other: 1829 (2014Ka35).
9596.9	3/2-	46 eV	1833.0		$\Gamma_p=45$ eV, $\Gamma_\alpha=1$ eV. Pol=+0.050 8 for 1830 7 (1967Br08).
9599.2	3/2-	70 eV	1835.3		$\Gamma_p=70$ eV. Pol=+0.056 8 for 1840 7 (1967Br08).
9605.6	1/2-, 3/2-	100 eV	1841.9		E(p)(lab): other: 1835 (2014Ka35). Γ : for 1/2-; 70 eV for 3/2-. $\Gamma_p=100,70$ eV. E(p)(lab): other: 1844 (2014Ka35).
9612.6	1/2-	357 eV	1849.1		$\Gamma_p=350$ eV, $\Gamma_\alpha=7$ eV.
9614.9	3/2-	30 eV	1851.4		$\Gamma_p=30$ eV. Pol=+0.061 7 for 1850 7 (1967Br08).
9623.0	3/2-	800 eV	1859.7		E(p)(lab): other: 1850 (2014Ka35). $\Gamma_p=800$ eV, $\Gamma_\alpha=4$ eV. Pol=+0.001 8 for 1860 7 (1967Br08).
9630			1867 ^h		
9636.7	3/2-	1250 eV	1873.8		$\Gamma_p=1250$ keV. 1968Sc11 report E(p)=1880, L=1, $\Gamma=23.0$ keV, $\Gamma_p=2.50$ keV. 1963Co04 report 1875 8, L=1, $\Gamma=3$ keV 1, S=0.5. Pol=-0.059 9 for 1870 7 (1967Br08).
9639.1	1/2+, 3/2-	60 eV	1876.2		Γ : for 1/2+; 140 eV for 3/2-. $\Gamma_p=60,140$ eV. E(p)(lab): other: 1875 (2014Ka35).
9639.8	3/2-	450 eV	1877.0	0.33	$\Gamma_p=450$ eV, $\Gamma_\alpha=1$ eV. Pol=-0.082 9 for 1880 7 (1967Br08).
9643			1880 ^h		
9647.0	3/2-	30 eV	1884.3	0.33	$\Gamma_p=30$ eV, $\Gamma_\alpha=1$ eV. E(p)(lab): other: 1885 (2014Ka35). E(p)(lab), Γ : 1968Sc11 report Ep=1880, $\Gamma=23$, $\Gamma_p=2.5$, L=0.

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$^{40}\text{Ar}(\text{p,p}),(\text{p},\alpha),(\text{p},\text{n})$: Res 1966Ke09,1968Sc11,1972Bu06 (continued) **^{41}K Levels (continued)**

E(level) [†]	J π^{d}	Γ^{c}	E(p)(lab) [‡]	S $^{\text{g}}$	Comments
9656.5	3/2-	70 eV	1894.1		$\Gamma_{\text{p}}=70$ eV, $\Gamma_{\alpha}=1$ eV. Pol=-0.073 9 for 1890 7 (1967Br08).
9659.7	3/2-	400 eV	1897.4		$\Gamma_{\text{p}}=400$ eV, $\Gamma_{\alpha}=3$ eV. 1963Co04 report 1890 8, L=1, $\Gamma=6$ keV 2, S=0.5. Pol=-0.118 14 for 1900 7 (1967Br08).
9663.9	1/2+	20 eV	1901.7		$\Gamma_{\text{p}}=15$ eV, $\Gamma_{\alpha}=5$ eV. E(p)(lab): other: 1902 (2014Ka35).
9675.7	1/2+	130 eV	1913.8		$\Gamma_{\text{p}}=125$ eV, $\Gamma_{\alpha}=5$ eV. Pol=-0.083 11 for 1910 7; J $\pi=3/2-$ (1967Br08). E(p)(lab): other: 1914 (2014Ka35).
9676.8	1/2+	19 eV	1914.9		$\Gamma_{\text{p}}=15$ eV, $\Gamma_{\alpha}=4$ eV.
9685.1	1/2-	66 eV	1923.4		$\Gamma_{\text{p}}=60$ eV, $\Gamma_{\alpha}=6$ eV.
9686.9	3/2-	52 eV	1925.2		$\Gamma_{\text{p}}=50$ eV, $\Gamma_{\alpha}=2$ eV. Pol=-0.054 11 for 1920 7 (1967Br08).
9693.3	1/2-	45 eV	1931.8		$\Gamma_{\text{p}}=45$ eV. Pol=-0.045 10 for 1930 7; J $\pi=3/2-$ (1967Br08). E(p)(lab): other: 1932 (2014Ka35).
9714			1953 ^h		
9719.0	1/2-	62 eV	1958.1		$\Gamma_{\text{p}}=60$ eV, $\Gamma_{\alpha}=2$ eV. Pol=-0.030 12 for 1960 7; J $\pi=3/2-$ (1967Br08). E(p)(lab): other: 1959 (2014Ka35).
9727			1966 ^h		
9731			1970 ^h		
9737			1977 ^h		
9743.7	1/2-	190 eV	1983.5		$\Gamma_{\text{p}}=180$ eV, $\Gamma_{\alpha}=11$ eV. E(p)(lab): other: 1985 (2014Ka35).
9750.7	1/2+, 3/2-	12 eV	1990.6		Γ : for 1/2+; 20 eV for 3/2-. $\Gamma_{\text{p}}=12,20$ eV. E(p)(lab): other: 1993 (2014Ka35).
9766.6	1/2-	50 eV	2006.9		$\Gamma_{\text{p}}=50$ eV. E(p)(lab): other: 2004 (2014Ka35).
9769.5	1/2+	70 eV	2009.9		$\Gamma_{\text{p}}=70$ eV. E(p)(lab): other: 2009 (2014Ka35).
9779			2020 ^h		
9787			2028 ^h		
9792.8 ^b	1/2-	53 eV	2033.8 ^b		$\Gamma_{\text{p}}=50$ eV, $\Gamma_{\alpha}=3$ eV.
9792.8 ^b	1/2+, 3/2-	100 eV	2033.8 ^b		Γ : for 1/2+; 175 eV for 3/2-. $\Gamma_{\text{p}}=100,175$ eV. E(p)(lab): other: 2035 (2014Ka35).
9796.7	3/2-	40 eV	2037.8		$\Gamma_{\text{p}}=35$ eV, $\Gamma_{\alpha}=5$ eV.
9803.7	1/2-	23 eV	2045.0		$\Gamma_{\text{p}}=20$ eV, $\Gamma_{\alpha}=3$ eV. E(p)(lab): other: 2046 (2014Ka35).
9821.1	1/2-	130 eV	2062.8		$\Gamma_{\text{p}}=130$ eV. E(p)(lab): other: 2061 (2014Ka35).
9828			2070 ^h		
9832			2074 ^h		
9837			2079 ^h		
9840.4	1/2-	150 eV	2082.6		$\Gamma_{\text{p}}=150$ eV, $\Gamma_{\alpha}=2$ eV.
9844.8	3/2-	155 eV	2087.1		$\Gamma_{\text{p}}=155$ eV, $\Gamma_{\alpha}=1$ eV. E(p)(lab): other: 2090 (2014Ka35).
9856.4	3/2-	70 eV	2099.0		$\Gamma_{\text{p}}=70$ eV, $\Gamma_{\alpha}=1$ eV.
9865.2	1/2-	114 eV	2108.0		$\Gamma_{\text{p}}=110$ eV, $\Gamma_{\alpha}=4$ eV.
9878.0	3/2-	21 eV	2121.1		$\Gamma_{\text{p}}=20$ eV, $\Gamma_{\alpha}=1$ eV. E(p)(lab): other: 2118 (2014Ka35).
9880.3	1/2+, 3/2-	23 eV	2123.5		Γ : for 1/2+; 36 eV for 3/2-. $\Gamma_{\text{p}}=20,35$ eV, $\Gamma_{\alpha}=3,1$ eV. E(p)(lab): other: 2123 (2014Ka35).
9885.7	3/2-	69 eV	2129.0		$\Gamma_{\text{p}}=60$ eV, $\Gamma_{\alpha}=9$ eV.
9901.9	3/2-	70 eV	2145.6		$\Gamma_{\text{p}}=70$ eV. E(p)(lab): other: 2143 (2014Ka35).
9907.3	1/2-	29 eV	2151.1		$\Gamma_{\text{p}}=22$ eV, $\Gamma_{\alpha}=7$ eV. E(p)(lab): other: 2152 (2014Ka35).
9910.4	1/2+	60 eV	2154.3		$\Gamma_{\text{p}}=60$ eV.

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$^{40}\text{Ar}(\text{p,p}),(\text{p},\alpha),(\text{p},\text{n})$: Res 1966Ke09,1968Sc11,1972Bu06 (continued) **^{41}K Levels (continued)**

E(level) [†]	J π^{d}	Γ^{c}	E(p)(lab) [‡]	S $^{\text{g}}$	Comments
9927.0	1/2-	60 eV	2171.3		$\Gamma_{\text{p}}=60$ eV. E(p)(lab): other: 2171 (2014Ka35).
9931.7	1/2-	50 eV	2176.2		$\Gamma_{\text{p}}=50$ eV. E(p)(lab): other: 2177 (2014Ka35).
9940.4	1/2-, 3/2-	120 eV	2185.1		Γ : for 1/2-; 70 eV for 3/2-. $\Gamma_{\text{p}}=120,70$ eV. E(p)(lab): other: 2180 (2014Ka35).
9946			2191 ^h		
9957			2202 ^h		
9961			2206 ^h		
9964.9	1/2+	60 eV	2210.2		$\Gamma_{\text{p}}=60$ eV. E(p)(lab): other: 2113 (2014Ka35).
9970.6	1/2+	110 eV	2216.0		$\Gamma_{\text{p}}=110$ eV. E(p)(lab): other: 2218 (2014Ka35).
9984.4	1/2-	300 eV	2230.2		$\Gamma_{\text{p}}=300$ eV. E(p)(lab): other: 2231 (2014Ka35).
9989			2235 ^h		
10000.0	1/2+	50 eV	2246.2		$\Gamma_{\text{p}}=50$ eV. E(p)(lab): other: 2246 (2014Ka35).
10014			2260 ^h		
10017.7	3/2-	22 eV	2264.3		$\Gamma_{\text{p}}=20$ eV, $\Gamma_{\alpha}=2$ eV. E(p)(lab): other: 2264 (2014Ka35).
10019.6	1/2+	210 eV	2266.2		$\Gamma_{\text{p}}=210$ eV. E(p)(lab): other: 2268 (2014Ka35).
10026			2273 ^h		
10030.1	1/2+	20 eV	2277.0		$\Gamma_{\text{p}}=15$ eV, $\Gamma_{\alpha}=5$ eV. E(p)(lab): other: 2279 (2014Ka35).
10034.5	1/2+	42 eV	2281.5		$\Gamma_{\text{p}}=40$ eV, $\Gamma_{\alpha}=2$ eV. E(p)(lab): other: 2282 (2014Ka35).
10042.9	3/2+	90 eV	2290.1		$\Gamma_{\text{p}}=30$ eV, $\Gamma_{\alpha}=60$ eV. E(p)(lab): other: 2292 (2014Ka35).
10044.1	3/2-	30 eV	2291.4		$\Gamma_{\text{p}}=30$ eV.
10053.7	1/2+	15 eV	2301.2		$\Gamma_{\text{p}}=15$ eV. E(p)(lab): other: 2301 (2014Ka35).
10057.2	1/2-	220 eV	2304.8		$\Gamma_{\text{p}}=220$ eV, $\Gamma_{\alpha}=1$ eV. E(p)(lab): other: 2306 (2014Ka35).
10063.0	3/2+	80 eV	2310.7		$\Gamma_{\text{p}}=30$ eV, $\Gamma_{\alpha}=50$ eV. E(p)(lab): other: 2310 (2014Ka35).
10068.7	1/2-	70 eV	2316.6		$\Gamma_{\text{p}}=70$ eV.
10072.4	1/2+	65 eV	2320.4		$\Gamma_{\text{p}}=65$ eV. E(p)(lab): other: 2321 (2014Ka35).
10077.7	3/2+	31 eV	2325.8		$\Gamma_{\text{p}}=30$ eV, $\Gamma_{\alpha}=1$ eV.
10081.7	1/2+	51 eV	2329.9		$\Gamma_{\text{p}}=50$ eV, $\Gamma_{\alpha}=1$ eV. E(p)(lab): other: 2330 (2014Ka35).
10088			2336 ^h		
10094			2342 ^h		
10098.0	1/2+	275 eV	2346.6		$\Gamma_{\text{p}}=275$ eV.
10105.4	1/2+	200 eV	2354.2		$\Gamma_{\text{p}}=200$ eV.
10108.6	1/2-	830 eV	2357.5		$\Gamma_{\text{p}}=830$ eV. E(p)(lab): other: 2356 (2014Ka35).
10111.2	1/2-	130 eV	2360.1		$\Gamma_{\text{p}}=130$ eV, $\Gamma_{\alpha}=1$ eV.
10124.6	1/2-	65 eV	2373.9		$\Gamma_{\text{p}}=55$ eV, $\Gamma_{\alpha}=10$ eV. E(p)(lab): other: 2373 (2014Ka35).
10128			2377 ^h		
10133.5	1/2+	150 eV	2383.0		$\Gamma_{\text{p}}=140$ eV, $\Gamma_{\alpha}=9$ eV. E(p)(lab): other: 2385 (2014Ka35).
10140.4	1/2-	40 eV	2390.1		$\Gamma_{\text{p}}=35$ eV, $\Gamma_{\alpha}=5$ eV.
10153.4	1/2+	77 eV	2403.4		$\Gamma_{\text{p}}=70$ eV, $\Gamma_{\alpha}=4$ eV, $\Gamma_{\text{n}}=3$ eV.
10154.2	1/2-	100 eV	2404.2		$\Gamma_{\text{p}}=100$ eV, $\Gamma_{\alpha}=1$ eV. E(p)(lab): other: 2405 (2014Ka35).
10160.5	1/2+	150 eV	2410.7		$\Gamma_{\text{p}}=150$ eV, $\Gamma_{\alpha}=3$ eV. E(p)(lab): other: 2409 (2014Ka35).
10162.5	1/2-	250 eV	2412.7		$\Gamma_{\text{p}}=250$ eV, $\Gamma_{\alpha}=1$ eV.

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⁴⁰Ar(p,p),(p,α),(p,n): Res 1966Ke09,1968Sc11,1972Bu06 (continued)

⁴¹K Levels (continued)

E(level) [†]	J _π ^d	Γ ^c	E(p)(lab) [‡]	S ^g	Comments
10166.0	1/2-	75 eV	2416.3		Γ _p =70 eV, Γ _α =5 eV. E(p)(lab): other: 2417 (2014Ka35).
10184.1	1/2+	600 eV	2434.9		Γ _p =600 eV. E(p)(lab): other: 2434 (2014Ka35).
10193.9	3/2-	750 eV	2444.9		Γ _p =750 eV, Γ _α =6 eV, Γ _n =1 eV. E(p)(lab): others:2440, Γ _n <0.3 keV (1968Yo05); 2443 (2014Ka35).
10199.6	1/2+	1.00 keV	2450.7		Γ _p =1.00 keV, Γ _α =13 eV. E(p)(lab): other: 2449 (2014Ka35).
10202.3	1/2+	750 eV	2453.5		Γ _p =750 eV.
10204.5	3/2-	150 eV	2455.8		Γ _p =140 eV, Γ _α =9 eV, Γ _n =2 eV. E(p)(lab): other: 2456 (2014Ka35).
10209.11	1/2-	80 eV	2460.5		Γ _p =40 eV, Γ _α =5 eV, Γ _n =35 eV. E(p)(lab): other: 2462 (2014Ka35).
10212.7	1/2+	360 eV	2464.2	0.05	1968Sc11 report E(p)=2460, L=0, Γ=16.0 keV, Γ _p =4.25 keV. Γ _p =340 eV, Γ _α =18 eV.
10221.0	1/2-	410 eV	2472.7		Γ _p =410 eV, Γ _n =1 eV. E(p)(lab): other: 2472 (2014Ka35).
10228.5	1/2+, 3/2-	175 eV	2480.4		Γ: for 1/2+; 270 eV for 3/2-. Γ _p =170,270 eV, Γ _α =6,2 eV. E(p)(lab): other: 2479 (2014Ka35).
10229.9	1/2-	100 eV	2481.8		Γ _p =90 eV, Γ _α =11 eV.
10234.3	3/2-	230 eV	2486.3		Γ _p =225 eV, Γ _α =6 eV. E(p)(lab): other: 2485 (2014Ka35).
10239.6	1/2-	80 eV	2491.8		Γ _p =40 eV, Γ _α =25 eV, Γ _n =15 eV. E(p)(lab): other: 2493 (2014Ka35).
10243.3	3/2-	45 eV	2495.5		Γ _p =25 eV, Γ _α =15 eV, Γ _n =5 eV.
10247.6	1/2-	1.40 keV	2500.0		Γ _p =1.40 keV, Γ _α =9 eV.
10249.7	3/2-	190 eV	2502.1		Γ _p =175 eV, Γ _α =7 eV, Γ _n =6 eV.
10258.5	1/2+	200 eV	2511.1		Γ _p =45 eV, Γ _α =125 eV, Γ _n =30 eV. E(p)(lab): other: 2510 (2014Ka35).
10268.1	1/2+	70 eV	2521.0		Γ _p =50 eV, Γ _α =15 eV, Γ _n =5 eV.
10278.3	3/2-	35 eV	2531.4		Γ _p =25 eV, Γ _α =4 eV, Γ _n =6 eV. E(p)(lab): other: 2531 (2014Ka35).
10286			2539 ^h		
10291.2	1/2-, 3/2-	200 eV	2544.6		Γ: for 1/2-; 70 eV for 3/2-. Γ _p =40,20 eV, Γ _α =100,30 eV, Γ _n =60,20 eV. E(p)(lab): others: 2540 (1968Yo05), 2545 (2015Ka35).
10292.4	1/2-, 3/2-	60 eV	2545.9		Γ: for 1/2-; 35 eV for 3/2-. Γ _p =35,25 eV, Γ _α =12,5 eV, Γ _n =13,5 eV.
10295.4	1/2-	100 eV	2548.9		Γ _p =90 eV, Γ _α =4 eV, Γ _n =6 eV.
10303.3	1/2-	250 eV	2557.0		Γ _p =180 eV, Γ _α =53 eV, Γ _n =15 eV.
10305.2	1/2+	30 eV	2559.0		Γ _p =25 eV, Γ _α =5 eV. E(p)(lab): other: 2558 (2014Ka35).
10306.1	1/2-	170 eV	2559.9		Γ _p =55 eV, Γ _α =15 eV, Γ _n =100 eV.
10314.6	1/2+	45 eV	2568.6		Γ _p =40 eV, Γ _α =5 eV. E(p)(lab): other: 2568 (2014Ka35).
10327.3	3/2-	270 eV	2581.6		Γ _p =250 eV, Γ _α =13 eV, Γ _n =4 eV. E(p)(lab): others: 2580 20 (1966Sk02), 2582 (2014Ka35).
10332.6	1/2-	50 eV	2587.8		Γ _p =30 eV, Γ _α =10 eV, Γ _n =10 eV. E(p)(lab): other: 2586 (2014Ka35).
10338.5	1/2+	43 eV	2593.8		Γ _p =40 eV, Γ _α =3 eV.
10340.2	1/2-	650 eV	2595.6		Γ _p =650 eV, Γ _α =2 eV.
10342.1	1/2+	175 eV	2597.5		Γ _p =175 eV, Γ _α =1 eV. E(p)(lab): other: 2598 (2014Ka35).
10344.3	1/2-	140 eV	2599.8		Γ _p =90 eV, Γ _α =47 eV.
10346.5	3/2+	125 eV	2602.0		Γ _p =75 eV, Γ _α =35 eV, Γ _n =15 eV.
10360			2615 ^h		
10373			2629 ^h		
10374			2630		
10415			2672 ^h		
10423			2680		
10460			2718 ^h		
10481			2740		E(p)(lab): 2740 20 (1966Sk02).

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$^{40}\text{Ar}(\text{p,p}),(\text{p},\alpha),(\text{p},\text{n})$: Res 1966Ke09,1968Sc11,1972Bu06 (continued) **^{41}K Levels (continued)**

E(level) [†]	J π^d	Γ^c	E(p)(lab) [‡]	S g	Comments
10560			2820		
10657			2920		
10706			2970		E(p)(lab): other: 2950 20 (1966Sk02) (doublet).
10794			3060		
10862			3130		
10979			3250		
11077			3350		E(p)(lab): other 3350 20 (1966Sk02) (doublet).
11106	3/2 ^{-e}	34.5 keV ^f	3380	0.06	1968Sc11 report E(p)=3390, L=1, Γ_p =7.50 keV. E(p)(lab): other: 3390 (1972Bu06). J π : from L=1 (1972Bu06). Possible IAR of 2740, 3/2 ⁻ level in ^{41}Ar (1972Bu06). Γ_n =12 keV (1968Yo05).
11204	1/2 ^{-e}	18.0 keV ^f	3480	0.05	1968Sc11 report E(p)=3490, L=1, Γ_p =7.0 keV. E(p)(lab): others: 3490 (1972Bu06), 3450 20 (1966Sk02) (doublet). Γ_n <2 keV (1968Yo05).
11233			3510		
11272		20.0 keV ^f	3550		1968Sc11 report tentative resonance at E(p)=3540 with L=2, Γ_p =6.0 keV. E(p)(lab): others: 3570 (1972Bu06), 3550 20 (1966Sk02).
11301?	1/2 ^{+e}	14.0 keV ^f	3580	0.02	E(level),E(p)(lab): From 1968Sc11 with L=0, Γ_p =3.5 keV.
11321	3/2 ^{-e}	12.0 keV ^f	3600 [#]	0.03	L=1, Γ_p =3.60 keV (1968Sc11). E(p)(lab): others: 3600 (1972Bu06), 3600 20 (1966Sk02). J π : from L=1 (1972Bu06). Possible IAR of 2955, 3/2 ⁻ level in ^{41}Ar (1972Bu06). Γ_n =3 keV (1968Yo05).
11360	1/2 ^{-e}	18.0 keV ^f	3640	0.06	1968Sc11 report E(p)=3650, L=1, Γ_p =7.70 keV. Γ_n =8 keV (1968Yo05). E(p)(lab): others: 3650 (1972Bu06), 3670 20 (1966Sk02). J π : 3/2 ⁻ from L=1 (1972Bu06). Possible IAR of 3017, 3/2 ⁻ level in ^{41}Ar (1972Bu06). L=0, Γ_p =4.50 keV (1968Sc11).
11428	1/2 ^{+e}	20.0 keV ^f	3710 [#]	0.02	1968Sc11 report E(p)=3740, L=0, Γ_p =3.00 keV.
11467	1/2 ^{+e}	9.0 keV ^f	3750	0.02	E(p)(lab): other: 3760 20 (1966Sk02). Γ_n =3 keV (1968Yo05).
11594	(3/2 ⁺) ^e	13.0 keV ^f	3880	0.05	1968Sc11 report tentative resonance at E(p)=3880 with L=2, Γ_p =3.00 keV. Γ_n =6 keV (1968Yo05).
11614?	(1/2 ⁺) ^e	13.0 keV ^f	3900 [#]	0.02	L=0, Γ_p =3.50 keV (1968Sc11).
11643	3/2 ^{-e}	13.5 keV ^f	3930		1968Sc11 report E(p)=3930, L=1, Γ_p =5.50 keV. Γ_n =7 keV (1968Yo05).
11672	3/2 ^{-e}	15.5 keV ^f	3960 [#]	0.05	L=0, Γ_p =5.50 keV (1968Sc11). E(p)(lab): others: 3960 (1972Bu06), 3980 (1967S105). J π : from L=1 (1972Bu06). Possible IAR of 3335, 3/2 ⁻ level in ^{41}Ar (1972Bu06).
11731	1/2 ^{+e}	17.0 keV ^f	4020	0.01	1968Sc11 report E(p)=4030, L=0, Γ =17.0 keV, Γ_p =4.50 keV. Γ_n =8 keV (1968Yo05).
11770	3/2 ^{-e}	21.0 keV ^f	4060	0.01	1968Sc11 report E(p)=4070, L=1, Γ_p =3.50 keV Γ_n =8 keV (1968Yo05). E(p)(lab): others: 4070 (1972Bu06), 4090 (1967S105). J π : from L=1 (1972Bu06). Possible IAR of 3438, 3/2 ⁻ level in ^{41}Ar (1972Bu06).
11857			4150 [§]		
11906			4200		E(p)(lab): other: 4190 (1972Bu06).
11984			4280		E(p)(lab): other: 4320 (1972Bu06).
12053			4350		
12101			4400		E(p)(lab): other: 4390 (1972Bu06).
12140			4440 [§]		
12179			4480		E(p)(lab): other: 4490 (1972Bu06).
12218			4520		
12248	1/2 ^{&}		4550 [§]		E(p)(lab): other: 4560 10 (1967S105).
12267	3/2 ^{&}		4570		E(p)(lab): other: 4580 10 (1967S105).
12316	1/2		4620		E(p)(lab): others: 4640 (1972Bu06), 4630 10 (1967S105).

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(\text{p,p}),(\text{p},\alpha),(\text{p,n})$: Res 1966Ke09,1968Sc11,1972Bu06 (continued) **^{41}K Levels (continued)**

E(level) [†]	J π ^d	Γ ^c	E(p)(lab) [‡]	Comments
12414			4720	E(p)(lab): other: 4680 (1972Bu06).
12453			4760	E(p)(lab): other: 4730 (1972Bu06).
12492			4800	
12521			4830	E(p)(lab): other: 4840 (1972Bu06).
12570			4880	
12609	1/2 ^{&}		4920 [@]	
12648			4960	
12687	1/2, 3/2 ^{&}		5000 [§]	E(p)(lab): other: 4990 10 (1967Sl05).
12716	3/2 ^{&}		5030 [@]	
12755	3/2 ^{&}		5070 [@]	
12823			5140 [§]	
12892	5/2+	39 eV	5210 [§]	Γ : from 1972Bu06. $\Gamma_p=5.0$ eV (1972Bu06). J π : from L=2 (1972Bu06). E(p)(lab): other: 5240 (1967Sl05). Possible IAR of 4577, 5/2+ level in ^{41}Ar (1972Bu06).
12999			5320 [§]	

[†] S(p)(^{41}K)+E(p)(c.m.), where S(p)(^{41}K)=7808.619 keV 5 (2012Wa38). E(p)(lab) are taken from 1966Ke09, unless otherwise stated.

The absolute uncertainty is 2 keV, whereas the relative uncertainty is 0.3 keV.

[‡] E(p)(lab) is in keV. Values are from 1966Ke09 below 2630, from 1968Yo05 above this energy, except where noted.

[§] From 1972Bu06, the uncertainty is ≈ 20 keV.

[#] From 1968Sc11, the uncertainty is ≈ 10 keV.

[@] From 1967Sl05, the uncertainty is ≈ 10 keV.

[&] From $\sigma(\theta)$ (1967Sl05).

^a From 1967Bl26.

^b Two resonances are listed by 1966Ke09 at the same energy, which may be a typographical error. The spectra presented by these authors do not help to obtain separate energies for these two resonances.

^c Value is for the first J π choice. Γ for the second J π is given under comments.

^d From 1966Ke09.

^e From 1968Sc11.

^f Γ in keV (1968Sc11).

^g From 1968Sc11, unless otherwise stated.

^h From 2014Ka35.

 $^{40}\text{Ar}(\text{d,n})$ 1970Ha37

1970Ha37 (also 1970Fu01): E=5.6 MeV. Measured $\sigma(\theta)$ for neutrons with tof method (FWHM=80 keV); DWBA analysis.

Others:

1958Be03: E=2.5, 3.0 MeV. Measured neutron energies using gas recoil fast neutron spectrometer. Three groups reported at 1370, 2400, and 3100 keV.

1950Wo03: E=3.2 MeV. Measured neutron energies using recoil coincidence technique. Four groups reported at g.s., 1340, 3100 and 4400 keV.

 ^{41}K Levels

E(level) [†]	L [‡]	(2J+1)C ² S ^{&}	Comments
0.0	2	1.6	
980 [#]	0	0.16	
1294 [#]	3	2.0	E(level): other: 1340 150 (1950Wo03).
1650 [§] 50	1	0.32	
3100 [@]			
4400 [@]			
8380 [§] 20	(3)	0.9	(2J+1)C ² S: 1978En02 give (2J+1)S=4.5 (C ² =1/5 for T=5/2).
8760 [§] 20	1	0.03	
8870 [§] 20	1	0.09	(2J+1)C ² S: 1978En02 give (2J+1)S=0.45 (C ² =1/5 for T=5/2).

[†] From 1970Ha37.

[‡] From DWBA analysis (1970Ha37).

[§] Unresolved multiplet.

Footnotes continued on next page

$^{40}\text{Ar}(\text{d},\text{n})$ 1970Ha37 (continued) **^{41}K Levels (continued)**

From the Adopted Levels rounded to the nearest keV. 1970Ha37 provide values from the literature.

@ From 1950Wo03, uncertainty is probably 200 keV.

& 1978En02 quote (2J+1)S values ($C^2=1$) for first four levels, adjusted upwards by $\approx 25\%$, based on standardized normalization factors deduced in 1977En02.

 $^{40}\text{Ar}(\text{d},\text{n}\gamma)$ 1978Ra13

E(d)=2.99 MeV. Measured E_γ , I_γ using a Ge(Li) detector; deduced $T_{1/2}$ using Doppler Shift Attenuation method (DSAM).

 ^{41}K Levels

E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$	E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$	E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$
0.0	3/2+		1582§	3/2-	>1.0 ps	2144	5/2+	0.25 ps 9
980§	1/2+	0.25 ps +14-10	1594	1/2+	0.083 ps 28	2166#	3/2-	>2.1 ps
1294	7/2-		1677	7/2+	>4.9 ps	2317	5/2-	0.062 ps 21
1560§	3/2+	0.39 ps 15	1698§	5/2+	0.24 ps 6			

† From the Adopted Levels.

‡ From DSAM measurements. Quoted uncertainties include a 25% contribution from uncertainties in stopping power theory, added in quadrature.

§ Corrected for feeding from higher energy levels.

Very small value of observed Doppler shift suggests that $T_{1/2}$ is probably in ns range (1978Ra13).

 $\gamma(^{41}\text{K})$

E_γ	E(level)	E_γ	E(level)	E_γ	E(level)
584 †	2144	1023	2317	1594	1594
	2166	1186 †	2166	1677	1677
602	1582	1294 †	1294	1698	1698
614	1594	1560	1560	2144	2144
980	980	1582	1582	2166	2166

† From spectrum given in Figure 3 of 1978Ra13.

Level Scheme

$^{40}\text{Ar}(^3\text{He},\text{d})$ 1975Me05,1975Me10

1975Me05, 1975Me10: $E(^3\text{He})=18$ MeV. Measured $\sigma(\theta)$ for $\theta=7.5^\circ$ to 45° using multiangle spectrograph and Ilford K2 emulsion plates (FWHM 25 keV); DWBA calculations. 1975Me05 report levels up to 7617 and 1975Me10 report proton-unbound levels from 7836 to 10239. For proton-unbound states (for levels ≥ 8349), 1975Me10 also list Γ_p values deduced from comparison of measured cross sections with DWBA calculations for $2p_{1/2}$, $2p_{3/2}$, $1d_{3/2}$ and $1f_{7/2}$ orbitals.

Other:

1970La06: $E=10$ MeV. Measured $\sigma(\theta)$ with FWHM =150 keV. A total of 11 groups reported up to 6570 with L-values and strengths. DWBA analysis. The groups reported were: 0.0 (L=2), 980 (L=0), 1310 (L=3), 1600 (L=1), 2200 (L=2), 2640 (L=1), 3090 (L=1), 4300 (L=1), 4530 (L=1), 6020 (L=1) and 6570 (L=1). Good agreement for the first four states with the results of 1975Me05, however, the large energy resolution of ≈ 150 keV makes a comparison with the higher energy levels difficult.

 ^{41}K Levels

Cross sections given under comments are for 18.75° , uncertainties are $<10\%$.

E(level) [†]	L ^{†‡}	(2J+1)C ² S ^{†§#}	Comments
0.0	2	1.53	
980 5	0	0.16	
1293 5	3	2.91	
1582 5	1	0.69	
1693 5			Very weak group.
2164 5	1	0.052	
2313 5	3	0.069	
2592 5	1	0.18	
2672 5	0	0.021	
2710 5	2	0.047	
2755 5	2	0.055	
3046 10	1	0.14	
3216@ 10	3+1, 3+0	0.16, 0.008	(2J+1)C ² S: 0.16, 0.0079 for L=3+1; 0.17, 0.0082 for L=3+0.
3446 10	3	0.24	
3480 10	3	0.076	
3619 10	1	0.0051	
3736 10	1	0.049	
3773 10	3	0.13	
3819 10	1	0.029	
3858 10	3	0.11	
3916 10	1	0.071	
4032 10	2	0.051	
4140 10	3	0.21	
4237@ 10	3+1	0.16, 0.047	
4339 10	3	0.043	
4443 10	1	0.035	
4478 10	1	0.025	
4587 10	3	0.032	
4661@ 10	3+1	0.024, 0.003	
4728 10	1	0.010	
4848 10	1	0.0093	
4922@ 10	3+1	0.037, 0.004	
4995 10	3	0.056	
5091 10	1	0.026	
5160 10	3	0.044	
5235 10	1	0.032	
5270 10	1	0.014	
5335 10	1	0.0032	
5393 10	1	0.065	
5448 10	1	0.016	
5543@ 10	3+1	0.03, 0.0056	
5620 10	1	0.0065	
5669 10	1	0.010	
5717 10	1	0.027	
5816 10	0	0.0092	
5852 10	3	0.033	
5894 10	1	0.027	
5933 10	1	0.014	
5986@ 10	3+1	0.085, 0.014	
6062 10	1	0.033	

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(^3\text{He},\text{d})$ 1975Me05,1975Me10 (continued) ^{41}K Levels (continued)

E(level) [†]	L [‡]	(2J+1)C ² S ^{†§} #	Comments
6109 10	1	0.010	
6190 10	1	0.019	
6261 10	1	0.021	
6303 10	1	0.013	
6350 10	3	0.049	
6504 10	1	0.056	
6601 10	1	0.0071	
6654 10	1	0.027	
6704 10	3	0.032	
6809 10	1	0.033	
6874 10	1	0.023	
6919 10	1	0.016	
6980 10	1	0.018	
7037@ 10	3+1	0.041, 0.018	
7085 10	3	0.078	
7159 10	1	0.032	
7232 10	1	0.013	
7319@ 10	3+1	0.035, 0.012	
7420 10	1	0.032	
7471 10	3	0.035	
7511 10	1	0.013	
7617 10	1	0.016	
7836 15	2, (1)	0.076, 0.048	dσ/dΩ=0.286 mb/sr.
7893 15	2, (1)	0.048, 0.031	dσ/dΩ=0.176 mb/sr.
7940 15	(3)	0.067	dσ/dΩ=0.224 mb/sr.
8041 15	(3)	0.039	dσ/dΩ=0.127 mb/sr.
8116 15	1	0.048	dσ/dΩ=0.236 mb/sr.
8152 15	1	0.026	dσ/dΩ=0.127 mb/sr.
8229 15	(3)	0.022	dσ/dΩ=0.068 mb/sr.
8268 15	1	0.022	dσ/dΩ=0.104 mb/sr.
8349 15	3	0.84	1978En02 give (2J+1)S=4.2 (C ² =1/5 for T=5/2). dσ/dΩ=2.45 mb/sr. E(level): analog of ^{41}Ar ground state with Jπ=7/2- (1975Me10). dσ/dΩ=0.180 mb/sr.
8464 15	1	0.044	dσ/dΩ=0.180 mb/sr.
8548 15	(3)	0.092	1978En02 give (2J+1)S=0.46 (C ² =1/5 for T=5/2). dσ/dΩ=0.254 mb/sr. E(level): analog of ^{41}Ar 167-keV level with Jπ=7/2- (1975Me10). dσ/dΩ=0.181 mb/sr.
8660 15	1	0.048	dσ/dΩ=0.181 mb/sr.
8748 15	1	0.064	dσ/dΩ=0.217 mb/sr.
8801 15	(1)	0.029	dσ/dΩ=0.101 mb/sr.
8873 15	1	0.18	1978En02 give (2J+1)S=0.90 (C ² =1/5 for T=5/2). dσ/dΩ=0.66 mb/sr. E(level): analog of ^{41}Ar 516-keV level with Jπ=3/2- (1975Me10). dσ/dΩ=0.301 mb/sr.
9050 15	(1)	0.15	dσ/dΩ=0.301 mb/sr.
9116 15	(3)	0.074	dσ/dΩ=0.179 mb/sr.
9203 15	3, (1)	0.038, 0.025	dσ/dΩ=0.089 mb/sr.
9243 15	1	0.028	dσ/dΩ=0.101 mb/sr.
9376 15	(2)	0.16	1978En02 give (2J+1)S=0.80 (C ² =1/5 for T=5/2). dσ/dΩ=0.44 mb/sr. E(level): analog of ^{41}Ar 1035-keV level with Jπ=(3/2)+ (1975Me10). dσ/dΩ=0.232 mb/sr.
9471 15	(1)	0.083	dσ/dΩ=0.232 mb/sr.
9626 15	1	0.38	1978En02 give (2J+1)S=1.9 (C ² =1/5 for T=5/2). dσ/dΩ=0.97 mb/sr. E(level): analog of ^{41}Ar 1354-keV level with Jπ=3/2- (1975Me10). dσ/dΩ=0.071 mb/sr.
9728 15	1	0.036	dσ/dΩ=0.071 mb/sr.
9789 15	(1)	0.033	dσ/dΩ=0.065 mb/sr.
9857 15	1	0.042	dσ/dΩ=0.077 mb/sr.
9936 15	(1)	0.036	1978En02 give (2J+1)S=0.18 (C ² =1/5 for T=5/2). dσ/dΩ=0.064 mb/sr. E(level): analog of ^{41}Ar 1635-keV level with Jπ=3/2- (1975Me10). dσ/dΩ=0.154 mb/sr.
10093 15	1	0.048	dσ/dΩ=0.154 mb/sr.

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(^3\text{He},\text{d})$ 1975Me05,1975Me10 (continued) **^{41}K Levels (continued)**

E(level) [†]	L ^{†‡}	(2J+1)C ² S ^{†§} #	Comments
10195@ 15	0+1	0.032, 0.020	1978En02 give (2J+1)S=0.16, 0.10 (C ² =1/5 for T=5/2). dσ/dΩ=0.046 mb/sr.
10239 15	(1)	0.054	E(level): analog of ^{41}Ar 1869-keV level with Jπ=1/2+ (1975Me10). dσ/dΩ=0.152 mb/sr.

[†] From 1975Me05 up to 7617 level and from 1975Me10 above this energy. For calibration purpose, precisely known energies of 980.42, 1293.66 and 2166.0 were used.

[‡] From comparison to DWBA calculations.

[§] From dσ/dΩ_{exp}=N(2J+1)C²S_{DWBA}/(2j+1) with N=4.42.

1978En02 quote (2J+1)S values (C²=1 for low-lying states) for levels up to 3216, adjusted upwards by ~25%, based on standardized normalization factors deduced in 1977En02. 1978En02 consider most of the higher levels as unresolved structures.

@ Doublet.

 $^{40}\text{K}(\text{n},\gamma)$ E=thermal 1984Kr05,1971Be05

σ_n=30.8 (2006MuZX, which adopted value from 1971Be05) Others: 90.7 (2013Fi01), 70.20 (1952Po29).

1984Kr05: measured E_γ, I_γ with ILL curved crystal Bragg spectrometer for γ rays below 1.5 MeV and with a pair spectrometer and a Ge detector above 1.5 MeV. See also 1987Kr01 (from the same group as 1984Kr05) for some revisions to the level scheme proposed in 1984Kr05.

1971Be05 (also 1970BeZM): measured E_γ, I_γ using a Ge(Li) detector surrounded by a bifurcated NaI(Tl) annular detector and γγ using two Ge(Li) detectors. A total of 123 secondary and 38 primary transitions were reported incorporated in a level scheme of 27 levels up to 3.3 MeV.

2013Fi01: Measured E_γ, I_γ, total radiative neutron σ using a HPGe detector.

 ^{41}K Levels

The following levels proposed by 1971Be05 only have been omitted since these are not confirmed in the more detailed study of 1984Kr05: 1516.8, 2304.5, 2599.8, 2681.5, 3042.1, 3116.2, 3164.5 and 3281.1. The transitions reported by 1971Be05 connected with these levels have either not been seen by 1984Kr05 or assigned elsewhere.

E(level) [‡]	Jπ [†]	Comments
0.0	3/2+	
980.476 8	1/2+	
1293.609 8	7/2-	
1559.903 12	3/2+	
1582.001 11	3/2-	
1593.107 12	1/2+	
1677.235 10	7/2+	
1698.005 15	5/2+	
2143.821 24	5/2+	
2166.695 24	3/2-	
2316.617 24	5/2-	
2440.18@ 4	(3/2, 5/2-)	
2447.83 7	(3/2+, 5/2, 7/2+)	Jπ: 1/2, 5/2 (1984Kr05).
2494.91 3	9/2+	
2507.93 3	7/2+	
2527.66 3	11/2+	
2593.97 3	1/2-, 3/2-	
2710.48@ 4	3/2+, 5/2+	
2712.57 3	(7/2)-	
2756.73 3	5/2+	
2761.73 3	11/2-	
2774.25 3	13/2+	
3048.22 5	1/2-, 3/2-	
3141.84 3	(7/2-)	
3142.43 3	5/2-	Jπ: 9/2+ (1984Kr05).
3213.61 4	5/2-	Jπ: 5/2 (1984Kr05).
3235.57 4	(3/2-, 5/2, 7/2-)	Jπ: 5/2, 7/2, (9/2-) (1984Kr05).
3240.65 4	(5/2+, 7/2-)	Jπ: 5/2+, 7/2, 9/2+ (1984Kr05).
3431.84 4	(9/2-, 7/2-)	

Continued on next page (footnotes at end of table)

$^{40}\text{K}(\text{n},\gamma)$ E=thermal 1984Kr05,1971Be05 (continued) **^{41}K Levels (continued)**

E(level) [‡]	J π [†]	Comments
3449.79@ 6	5/2-, 7/2-	
3489.30\$ 15	(5/2)+	J π : 3/2-, 5/2, 7/2 (1984Kr05).
3521.38\$ 9	(5/2+, 7/2+)	
3534.45 4	(7/2+, 9/2, 11/2+)	
3560.61 5	(3/2-, 5/2, 7/2+)	
3572.38@ 5		
3612.77 5		
3651.46 5	(5/2, 7/2-)	
3761.54 5		
3774.66 5	5/2-, 7/2-	J π : 5/2 (1984Kr05).
3826.90 4	(5/2, 7/2+)	J π : 5/2, 7/2+ (1984Kr05).
3870.52\$ 6	5/2-, 7/2-	J π : 5/2, 7/2, 9/2+ (1984Kr05).
3990.40?# 5		J π : 7/2-, 9/2 (1984Kr05).
3996.49 4	(5/2+)	
4026.94\$ 7		J π : 5/2, 7/2+ (1984Kr05).
4146.15 6	5/2-, 7/2-	J π : 5/2, 7/2, 9/2+ (1984Kr05).
4164.57 4		J π : 5/2, 7/2 (1984Kr05).
4220.62 5	(5/2)	
4228.99 5	(5/2)-	J π : 5/2, 7/2+ (1984Kr05).
4244.22 5	(3/2)-	J π : 5/2+ (1984Kr05).
4260.36 13		J π : 5/2 (1984Kr05).
4274.96 5	(7/2-, 9/2+)	
4303.01 5	(5/2+, 7/2+)	J π : 5/2, 7/2+ (1984Kr05).
4345.66 5	(5/2, 7/2-)	J π : 5/2+, 7/2- (1984Kr05).
4459.72 5	1/2-, 3/2-	J π : 5/2+ (1984Kr05).
4525.37\$ 5		J π : 5/2, 7/2, 9/2+ (1984Kr05).
4568.75\$ 5	(9/2+, 11/2-)	J π : 9/2+ (1984Kr05).
4609.48 7	(5/2+, 7/2, 9/2+)	
4730.70 5	(3/2)-	J π : 5/2, 7/2, 9/2 (1984Kr05).
4735.86 6	(5/2+, 7/2+)	
4745.49 10	(5/2+)	
4749.47 8	(3/2-, 5/2, 7/2+)	J π : 5/2, 7/2+ (1984Kr05).
4823.33 5	(7/2+, 9/2+)	
4862.43 6	(3/2+, 5/2)	
4927.83 6	(5/2)+	
4948.94\$ 6	(3/2-, 5/2, 7/2-)	J π : 5/2, 7/2- (1984Kr05).
5021.23?# 8		
5096.20 8		J π : 5/2, 7/2 (1984Kr05).
5185.27 6	(5/2, 7/2-)	J π : 5/2, 7/2, 9/2 (1984Kr05).
5298.86 6	(3/2-, 5/2, 7/2-)	J π : 5/2, 7/2 (1984Kr05).
5496.61 7	(7/2+)	
5548.19 7	(3/2+, 5/2+, 7/2+)	
5557.39?# 9		J π : 5/2+ (1984Kr05).
5575.24?# 8	(3/2-, 5/2, 7/2+)	J π : 5/2, 7/2+ (1984Kr05).
5604.58\$ 8	(3/2-, 5/2, 7/2+)	J π : 5/2, 7/2+ (1984Kr05).
5610.83\$ 6	(5/2, 7/2+)	J π : 5/2, 7/2 (1984Kr05).
5655.66 8	(3/2-, 5/2+)	J π : 5/2+ (1984Kr05).
5659.25\$ 8	(3/2-, 5/2, 7/2+)	J π : 5/2, 7/2+ (1984Kr05).
5800.80\$ 7	(3/2+, 5/2+)	J π : 5/2+ (1984Kr05).
5826.66 7	(5/2)+	J π : 5/2-, 7/2, (9/2-) (1984Kr05).
5886.95 8	(3/2)-	J π : 5/2+ (1984Kr05).
5912.50 8	(9/2+)	
5952.41\$ 8	(7/2-, 9/2-)	J π : 7/2-, 9/2 (1984Kr05).
5968.89\$ 8	(9/2+, 11/2-)	J π : 9/2+ (1984Kr05).
6040.67 10	(3/2-, 5/2, 7/2)	J π : 5/2, 7/2 (1984Kr05).
6070.76 9	(5/2, 7/2, 9/2+)	
6078.56 7	(3/2)-	J π : 5/2, 7/2- (1984Kr05).
6186.04 11	(5/2, 7/2, 9/2-)	J π : 5/2+, 7/2, 9/2 (1984Kr05).
6211.50 7	(7/2+, 9/2-)	J π : 7/2+, 9/2 (1984Kr05).
6229.88?# 10	(3/2-, 5/2, 7/2-)	J π : 5/2+, 7/2, 9/2+ (1984Kr05).
6255.96 8	(5/2, 7/2-)	
6290.05 14	(3/2)-	J π : 5/2+ (1984Kr05).
6394.31 10	(3/2-, 5/2, 7/2-)	J π : 5/2, 7/2+ (1984Kr05).

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⁴⁰K(n,γ) E=thermal 1984Kr05,1971Be05 (continued)

⁴¹K Levels (continued)

E(level) [‡]	Jπ [†]	Comments
6434.51 9	(3/2-, 5/2, 7/2-)	Jπ: 5/2,7/2,(9/2-) (1984Kr05).
6450.15?# 10	(3/2-, 5/2, 7/2+)	Jπ: 5/2,7/2+ (1984Kr05).
6497.00?# 10	(3/2)-	Jπ: 5/2,7/2,9/2 (1984Kr05).
6528.13 9	(3/2-, 5/2, 7/2-)	Jπ: 5/2,7/2,9/2+ (1984Kr05).
6769.77 10	(3/2-, 5/2, 7/2-)	Jπ: 5/2,7/2- (1984Kr05).
6782.54§ 10		Jπ: 5/2,7/2,9/2 (1984Kr05).
6791.36§ 9	(5/2, 7/2-)	Jπ: 5/2,7/2 (1984Kr05).
6835.43 9	(5/2, 7/2-)	Jπ: 5/2,7/2+ (1984Kr05).
6995.53§ 11	(5/2, 7/2, 9/2+)	
7020.97 10	(3/2)-	Jπ: 5/2,7/2,9/2+ (1984Kr05).
7035.28 14	(5/2)-	Jπ: 5/2,7/2+ (1984Kr05).
7361.15?# 11	(3/2-, 5/2, 7/2-)	Jπ: 5/2,7/2- (1984Kr05).
7593.06§ 9		Jπ: 5/2,7/2,9/2 (1984Kr05).
7654.93 9	(3/2-, 5/2, 7/2-)	Jπ: 5/2,7/2,9/2+ (1984Kr05).
7938.98 10		Jπ: 5/2,7/2,9/2 (1984Kr05).
8190.21§ 12	(3/2-, 5/2, 7/2-)	Jπ: 5/2,7/2,9/2+ (1984Kr05).
8200.11 9	(5/2-, 7/2-, 3/2+)	Jπ: 5/2,7/2,9/2+ (1984Kr05).
9740.70§ 10	(3/2)-	Jπ: 5/2,7/2,9/2 (1984Kr05).
(10095.25 10)	7/2-, 9/2-	E(level): S(n)=10095.37 6 (2012Wa38). Observed deexcitation intensity is 70% of g.s. feeding. Jπ: s-wave capture in ⁴⁰ K (g.s. Jπ=4-), but population of mainly the levels of J<11/2 shows that the dominant component is 7/2- (1984Kr05).

[†] From the Adopted Levels. Jπ's proposed by 1984Kr05 are given under comments when these differ from those in adopted levels. These are based on prior literature values as well as the assumption that only E1, M1, and E2 transitions are observed.

[‡] From a least-squares fit to E_γ by evaluators.

§ Probable state (1984Kr05).

Tentative state (1984Kr05).

@ Level proposed by 1987Kr01.

γ(⁴¹K)

The following weak primary transitions were reported by 1971Be05 only: 6111.5, 6395.5, 6500.8, 6620.6, 6629.3, 6979.3, 7416.6, 7791.5 and 8579.2. 6500.8γ and 6395.5γ were not seen by 1984Kr05 while all the other γ rays are assigned by 1984Kr05 to the ³⁵Cl(n,γ) reaction.

The following weak secondary transitions were reported by 1971Be05 only: 198.8, 516.6, 788.4, 1122.2, 1164.1, and 1734.8. 516.6γ is assigned by 1984Kr05 to ³⁵Cl(n,γ) and 1122.2γ as possible double escape line of 2144γ.

Placements by 1971Be05 of 788.4γ from 3236 level and 1164.1γ from 2144 level were not confirmed by 1984Kr05. γγ coin information is adopted by 1984Kr05 from 1971Be05.

Eγ [†]	E(level)	I _γ ^{†d}	Comments
191.24§ 6	2507.93	0.008 2	
193.73 11	4220.62	0.003 2	
246.587 3	2774.25	0.54 8	
258.53 5	5557.39?	0.015 3	
266.841 19	2761.73	0.009 3	
288.388 6	1582.001	0.035 12	
293.786 ^e 10	3534.45	0.023 ^e 5	
	4568.75	0.023 ^e 5	
296.340 23	4525.37	0.008 2	
304.76 4	4525.37	0.006 2	
^x 314.73 11		0.007 3	
^x 327.766 2		0.028 6	
^x 336.627 6		0.079 13	
338.47 6	6835.43	0.004 2	
339.41 4	4948.94	0.008 2	
344.79 8	3996.49	0.143 22	
354.541 7	(10095.25)	0.113 17	
358.465 13	4228.99	0.15 4	
361.99 3	5185.27	0.011 2	
364.089 7	2507.93	0.19 3	
371.51§ 6	4146.15	0.048 8	

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$^{40}\text{K}(\text{n},\gamma)$ E=thermal 1984Kr05,1971Be05 (continued)

 $\gamma(^{41}\text{K})$ (continued)

$E_{\gamma}^{\dagger}$	E(level)	$I_{\gamma}^{\dagger d}$	Comments
380.13 7	3141.84	0.005 2	
380.696 ^{a f} 8	3142.43	0.067 10	
383.617 6	1677.235	0.142 21	
385.107 [§] 7	3141.84	0.099 19	
395.945 2	2712.57	0.62 13	
402.08 3	4228.99	0.018 5	
403.03 [§] 3	4164.57	0.018 4	
^x 417.190 5		0.037 8	
418.80 4	3560.61	0.006 2	
419.31 ^e 3	5604.58	0.007 ^e 2	
	6078.56	0.007 ^e 2	
429.790 [§] 10	3990.40?	0.114 22	
445.814 5	2143.821	0.23 5	
454.557 7	5185.27	0.022 5	
^x 476.62 4		0.008 2	
^x 481.242 [‡] 20		0.013 3	
^x 487.991 23		0.009 2	
492.821 23	7020.97	0.009 2	
539.09 3	3774.66	0.018 4	
^x 541.83 [‡] 3		0.035 7	
545.876 7	2712.57	0.072 17	
548.365 10	4823.33	0.043 11	
550.73 3	2143.821	0.009 3	
561.05 [§] 4	3774.66	0.011 3	
561.842 22	2143.821	0.014 3	
^x 564.01 3		0.013 3	
^x 565.73 3		0.016 14	
566.650 [@] 17	2710.48	0.087 18	
568.170 17	5298.86	0.098 19	
573.597 9	2166.695	0.052 12	
579.418 7	1559.903	0.89 17	
583.900 15	2143.821	1.4 3	
584.685 11	2166.695	0.22 5	
586.26 4	3826.90	0.009 4	
592.777 [§] 25	4244.22	0.016 5	
601.517 12	1582.001	0.76 18	
606.824 18	2166.695	0.027 8	
607.846 ^e 9	4220.62	0.089 ^e 21	
	6434.51	0.089 ^e 21	
612.637 8	1593.107	0.26 8	
612.925 8	2756.73	0.31 7	
614.766 ^{a f} 7	3142.43	0.091 23	
620.34 3	5548.19	0.012 3	
623.486 [§] 14	6450.15?	0.049 13	
633.891 8	3141.84	0.72 17	
^x 635.073 18		0.061 17	
639.345 11	2316.617	0.031 17	
645.17 6	6255.96	0.015 3	
646.924 4	3141.84	0.40 9	
655.60 3	5604.58	0.011 3	
^x 657.93 5		0.006 3	
659.92 ^e 9	4220.62	0.025 ^e 6	
	5185.27	0.025 ^e 6	
^x 660.935 11		0.045 14	
^x 661.23 4		0.057 15	
670.112 8	3431.84	0.38 10	
^x 672.039 [‡] 13		0.064 17	
^x 676.09 3		0.023 5	
685.056 ^e 8	3826.90	0.083 ^e 20	
	4459.72	0.083 ^e 20	
694.199 10	4345.66	0.20 4	
712.800 ^e 17	5575.24?	0.034 ^e 8	
	6791.36	0.034 ^e 8	

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$^{40}\text{K}(\text{n},\gamma)$ E=thermal 1984Kr05,1971Be05 (continued) $\gamma(^{41}\text{K})$ (continued)

$E_{\gamma}^{\dagger}$	E(level)	$I_{\gamma}^{\dagger d}$	Comments
719.272 12	3431.84	0.30 6	
732.714 ^e 6	3240.65	0.51 ^e 12	
	4164.57	0.51 ^e 12	
734.605 8	2316.617	0.45 11	
740.51 4	4274.96	0.032 9	
742.142 ^{@e} 13	2440.18	0.100 ^e 21	
	5604.58	0.100 ^e 21	
745.733 13	3240.65	0.18 4	
768.531 19	4303.01	0.079 21	
773.471 19	5298.86	0.11 3	
796.926 20	2494.91	0.88 22	
817.659 9	2494.91	2.3 5	
825.19 3	3141.84	0.038 8	
^x 827.33 8		0.018 5	
830.679 9	2507.93	2.7 6	
846.967 ^{@e} 23	2440.18	0.067 ^e 15	
	4459.72	0.067 ^e 15	
850.417 7	2527.66	3.1 7	
854.043 20	3996.49	0.24 7	
854.642 20	3996.49	0.15 6	
880.14 3	5610.83	0.074 15	
887.13 ^e 5	5496.61	0.070 ^e 21	
	6186.04	0.070 ^e 21	
891.260 20	5912.50	0.081 16	
895.955 ^{a f} 10	2593.97	0.33 7	
904.38 ^{a e f} 3	3048.22	0.063 ^e 13	
	6791.36	0.063 ^e 13	
918.949 13	3235.57	0.86 20	
948.001 13	2507.93	0.51 11	
974.67 [§] 7	4749.47	0.079 17	
980.461 16	980.476	3.4 7	
988.47 [§] 6	4228.99	0.065 14	
993.21 8	4228.99	0.036 9	
998.45 7	3142.43	0.043 10	
1004.87 3	3761.54	0.091 19	
1006.81 3	3534.45	0.44 9	
1011.89 21	2593.97	0.11 3	
1014.498 18	2712.57	0.33 7	
1022.996 7	2316.617	11.2 25	
1026.48 ^e 6	3521.38	0.084 ^e 22	
	3534.45	0.084 ^e 22	
1039.532 12	3534.45	0.61 13	
1041.51 5	3489.30	0.108 25	
1051.27 4	5800.80	0.064 14	
1058.708 15	2756.73	0.41 8	
^x 1062.55 6		0.057 13	
1064.926 ^e 20	5800.80	0.29 ^e 6	
	7593.06	0.29 ^e 6	
1079.44 [§] 4	2756.73	0.066 17	
1090.74 5	5826.66	0.117 25	
1096.832 17	3240.65	0.24 5	
1101.71 3	4244.22	0.15 3	
1110.083 14	4345.66	0.78 16	
1115.20 [§] 3	3431.84	0.19 4	
1130.76 20	2712.57	0.64 11	
1156.32 [§] 12	5886.95	0.14 4	
1186.170 17	2166.695	0.60 16	
1196.785 17	2756.73	0.50 10	
1201.303 ^a 17	2494.91	1.5 4	
1203.21 5	4345.66	0.17 4	
1214.327 22	2507.93	0.69 14	
1228.59 5	3990.40?	0.21 4	
^x 1231.46 16		0.15 6	

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$^{40}\text{K}(\text{n},\gamma)$ E=thermal 1984Kr05,1971Be05 (continued) $\gamma(^{41}\text{K})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\dagger d}$	Comments
1247.40 4	6070.76	0.24 5	
^x 1250.85 9		0.084 20	
1255.71 7	3572.38	0.18 7	
1266.45 ^{aef} 22	3761.54	0.14 ^e 3	
	3774.66	0.14 ^e 3	
1286.03 10	6782.54	0.17 5	
1293.586 7	1293.609	41 9	$\sigma_{\gamma}=37.1$ b 19 (2013Fi01).
1321.33 ^s 9	5096.20	0.087 22	
1356.0 ^s 3	5659.25	0.051 14	
1368.47 12	4609.48	0.12 3	
^x 1373.02 5		0.31 7	
1418.975 15	2712.57	3.2 8	
1463.35 ^a 12	2756.73	0.69 23	
1465.10 5	3142.43	1.2 3	
1468.090 12	2761.73	3.3 7	
1470.99 17	6769.77	0.18 8	
^x 1481.59 16		0.08 3	
1488.54 4	3996.49	0.34 7	
1499.78 ^s 13	5496.61	0.25 5	
1513.31 ^s 8	4274.96	0.40 4	
1529.97 25	5557.39?	0.057 7	
1534.2 ^s 5	7361.15?	0.030 5	
1542.19 ^s 21	3240.65	0.066 8	
1557.67 18	5548.19	0.211 25	
1559.89 3	1559.903	4.1 4	
^x 1563.96 11		0.167 17	
1581.98 4	1582.001	3.7 4	
1588.68 ^s 11	4730.70	0.133 14	
1593.4 ^s 5	1593.107	0.31 3	
1606.05 ^e 8	5826.66	0.194 ^e 20	
	6791.36	0.194 ^e 20	
1624.76 16	5185.27	0.116 13	
1631.5 ^{s@f} 4	3213.61	0.26 7	
1649.96 ^e 14	4244.22	0.157 ^e 17	
	6835.43	0.157 ^e 17	
1666.51 15	4260.36	0.101 12	
1677.23 4	1677.235	19.7 20	$\sigma_{\gamma}=13$ b 3 (2013Fi01).
1697.93 4	1698.005	8.1 8	
1716.2 ^s 5	4164.57	0.032 7	
1721.02 ^s 4	4228.99	0.51 5	
1727.24 ^e 24	3870.52	0.123 ^e 15	
	7938.98	0.123 ^e 15	
1739.14 7	6835.43	0.27 3	
1747.88 ^s 16	5912.50	0.098 11	
1753.64 18	5185.27	0.088 10	
^x 1763.7 ^z 3		0.051 7	
1770.55 ^e 22	6229.88?	0.072 ^e 8	
	6791.36	0.072 ^e 8	
1790.3 3	3489.30	0.069 8	
1794.6 9	4568.75	0.199 20	
1804.7 ^s 3	5968.89	0.033 8	
1808.7 ^e 3	4303.01	0.06 ^e 3	
	5298.86	0.06 ^e 3	
1840.93 15	6450.15?	0.111 12	
1848.82 4	3142.43	3.5 4	
1852.85 6	4609.48	0.40 4	
1857.90 10	6078.56	0.191 20	
1867.45 ^e 25	5298.86	0.069 ^e 8	
	7938.98	0.069 ^e 8	
1895.09 ^c 4	3572.38	1.11 ^c 11	
1904.97 7	(10095.25)	0.32 3	
1909.74 14	8200.11	0.28 3	
1919.95 4	3213.61	2.07 21	

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⁴⁰K(n,γ) E=thermal 1984Kr05,1971Be05 (continued)

γ(⁴¹K) (continued)

Eγ [†]	E(level)	Iγ ^{†d}	Eγ [†]	E(level)	Iγ ^{†d}
1941.91 4	3235.57	1.91 19	2480.92 5	3774.66	0.63 6
1946.95 4	3240.65	0.97 10	2487.27 4	4164.57	1.53 15
1953.08 3	5604.58	0.102 12	2502.12 5	(10095.25)	0.73 7
^x 1965.91 13		0.146 15	2507.88 4	2507.93	3.2 3
1974.22 4	3651.46	1.08 11	2513.88 12	5655.66	0.25 3
1986.36 ^e 23	4303.01	0.081 ^e 9	2521.84 ^e 24	4220.62	0.111 ^e 13
	7938.98	0.081 ^e 9		6782.54	0.111 ^e 13
^x 1998.93 4		0.17 3	2531.48 12	6528.13	0.44 5
2011.78 9	6255.96	0.222 23	2534.48 4	8190.21	0.161 21
2026.48 3	5800.80	0.09 3	2543.498 19	4220.62	0.210 22
2030.518 20	3612.77	0.122 13	2559.98 3	6835.43	0.19 3
2041.028 7	4568.75	0.37 4	2562.558 11	4260.36	0.72 8
2046.318 16	6290.05	0.168 18	2567.48 4	6394.31	0.096 12
2059.88 3	5886.95	0.120 16	2576.48 ^e 25	3870.52	0.107 ^e 13
2062.78 3	4228.99	0.197 22		4274.96	0.107 ^e 13
2066.18 4	4823.33	0.070 10	^x 2583.83 14		0.028 10
2077.558 12	4244.22	0.28 3	2588.38 5	5096.20	0.19 4
2083.64 7	6229.88?	0.33 3	2590.68 7	5826.66	0.13 3
2089.128 24	6434.51	0.085 10	^x 2599.44 8		0.38 4
^x 2100.723 5		0.43 4	2605.08 7	4303.01	0.45 5
2106.50 19	7654.93	0.112 12	2611.15 12	4927.83	0.33 3
2114.10 25	4609.48	0.83 8	2615.488 25	7361.15?	0.198 21
2121.408 25	8200.11	0.105 12	2619.41 19	6394.31	0.214 23
2128.68 3	3826.90	0.118 14	2647.83 ^e 25	4345.66	0.114 ^e 13
2138.12 4	3431.84	1.01 10		5096.20	0.114 ^e 13
2143.71 4	2143.821	4.7 5	^x 2658.83 18		0.04 3
2149.738 5	3826.90	0.43 4	2668.55 10	4345.66	1.19 12
2156.17@ 6	3449.79	1.26 13	2671.18 4	5912.50	0.23 3
2158.938 8	6186.04	0.54 6	2677.278 10	5185.27	0.43 4
2166.72 5	2166.695	0.49 5	^x 2681.543 13		0.30 3
2171.01 6	4927.83	0.47 5	2688.19 12	6450.15?	0.34 4
2192.21 12	3774.66	0.28 3	2692.14 22	6995.53	0.198 22
2195.588 14	3489.30	0.25 3	2702.64 7	3996.49	0.49 5
2201.53 ^e 9	3761.54	0.26 ^e 3	2710.41@ 16	2710.48	0.188 20
	4345.66	0.26 ^e 3	^x 2719.223 17		0.181 19
2211.93 19	7035.28	0.177 19	2727.07 18	7654.93	0.173 18
2215.338 21	4927.83	0.156 17	2733.90 7	(10095.25)	0.56 6
2240.958 7	4735.86	0.68 7	2756.68 4	2756.73	2.7 3
2250.388 ^{a f} 15	4745.49	0.213 22	2763.40 6	4345.66	0.58 6
2268.138 19	4862.43	0.125 14	^x 2780.15 15		0.30 3
2278.58 6	6040.67	0.047 8	2784.088 17	5496.61	0.26 3
2295.98 3	4823.33	0.196 25	2794.04 ^{a f} 20	3774.66	0.26 7
2298.55 12	3996.49	0.46 5	2805.218 13	6040.67	0.29 3
2304.838 17	5826.66	0.138 15	2809.98 4	5952.41	0.099 12
2315.33 20	4823.33	0.51 8	^x 2817.10 13		0.237 25
2316.55 20	2316.617	0.38 7	2827.068 24	6040.67	0.136 16
2319.27 5	3996.49	1.37 14	2833.7 3	6394.31	0.136 16
2328.348 15	4823.33	0.156 17	2838.18 3	6078.56	0.120 14
2355.98 6	7654.93	0.093 19	2850.28 4	5298.86	0.29 6
2358.468 23	3651.46	0.24 3	2852.25 17	4146.15	0.83 10
2375.78 3	4823.33	0.083 10	2862.578 15	5575.24?	0.44 5
2381.18 4	4525.37	0.16 3	^x 2865.83 3		0.30 3
2383.48 4	5096.20	0.18 3	^x 2869.7 3		0.188 22
2405.64 21	5548.19	0.117 14	2875.7 3	6528.13	0.122 15
2414.928 7	5655.66	0.48 5	^x 2887.18 6		0.57 6
2419.038 8	4735.86	0.47 5	2899.77 6	4459.72	0.79 8
2428.928 18	4745.49	0.231 24	2919.06 13	7654.93	0.25 3
2433.168 21	7361.15?	0.29 3	2926.96 6	4220.62	0.58 6
2436.61 9	3996.49	0.98 10	2935.07 5	4228.99	0.96 10
2440.28@ 6	2440.18	0.86 9	2945.088 12	6186.04	0.33 3
2447.778 6	2447.83	0.45 5	2950.55 5	4244.22	1.63 16
2458.5 3	6070.76	0.090 10	2963.08 4	5557.39?	0.086 13
2466.90 ^{a f} 7	4026.94	0.73 7	2968.61 ^e 18	5496.61	0.217 ^e 23

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⁴⁰K(n,γ) E=thermal 1984Kr05,1971Be05 (continued)

γ(⁴¹K) (continued)

Eγ [†]	E(level)	Iγ ^{†d}	Eγ [†]	E(level)	Iγ ^{†d}
2968.61 ^e 18	6995.53	0.217 ^e 23	3565.4 [§] 7	(10095.25)	0.46 12
2981.26 5	4274.96	2.55 25	*3578.95& 24		0.108 11
2988.2 [§] 10	5496.61	0.034 8	*3585.54 16		0.165 13
*2995.81 19		0.186 20	3597.88 15	(10095.25)	0.229 17
3001.4 3	5496.61	0.133 16	3612.91 11	3612.77	0.268 17
3015.8 [§] 4	3996.49	0.132 25	*3620.27 10		0.294 18
3024.88 21	7020.97	0.31 3	3627.74 [§] 14	6769.77	0.209 15
3038.4 3	4735.86	0.32 4	3634.1 [§] 3	4927.83	0.073 10
3042.81 20	6186.04	0.62 5	3644.2 3	(10095.25)	0.23 3
3047.8 [§] 3	3048.22	0.47 5	3655.0 3	4948.94	0.23 3
3051.7 [§] 3	4345.66	0.37 5	3660.75 13	(10095.25)	0.64 5
3059.75 10	(10095.25)	0.87 6	*3670.55 25		0.152 17
3067.79 ^{§af} 20	4745.49	0.37 3	3683.71 7	6211.50	0.91 5
3073.97 9	(10095.25)	1.15 7	3693.2 [§] 3	6835.43	0.116 15
3086.7 [§] 7	6229.88?	0.09 3	3700.85 10	(10095.25)	0.53 3
*3090.0 [‡] 8		0.07 3	3715.9 ^e 4	5298.86	0.095 ^e 15
3099.57 10	(10095.25)	0.41 3		6211.50	0.095 ^e 15
3124.5 [§] 7	4823.33	0.049 15	3723.9 3	6040.67	0.118 15
3129.59 [§] 15	5886.95	0.258 22	3740.45 [§] 23	8200.11	0.25 3
3138.25 14	5912.50	0.251 22	3747.9 ^e 6	6255.96	0.095 ^e 20
3146.19 13	4823.33	0.44 3		7361.15?	0.095 ^e 20
3150.6 [§] 3	5912.50	0.223 25	3761.21 7	3761.54	1.69 9
3155.0 [§] 3	5298.86	0.154 22	3774.74 12	3774.66	0.60 4
3163.67 10	4745.49	0.61 4	3785.6 [§] 3	7020.97	0.179 23
3179.67 10	5496.61	0.65 4	3792.6 3	7938.98	0.201 24
3185.2 [§] 3	4862.43	0.177 22	3805.04 11	(10095.25)	0.69 4
3191.2 3	5952.41	0.33 4	3815.21 10	6528.13	0.67 4
3194.8 [§] 6	5968.89	0.12 3	3826.55 [§] 15	3826.90	0.40 3
*3201.9 4		0.156 21	3839.07 11	(10095.25)	0.58 4
3206.7 [§] 3	5968.89	0.201 23	3865.20 12	(10095.25)	0.327 21
3213.7 ^{§af} 4	3213.61	0.122 18	3870.84 11	5548.19	0.364 22
3229.6 [§] 5	4927.83	0.44 11	3883.57 6	(10095.25)	1.04 6
*3244.1 [‡] 3		0.38 5	*3889.75 18		0.229 17
3253.1 [§] 9	4927.83	0.31 16	3895.0 4	6211.50	0.078 11
3259.52 14	(10095.25)	1.08 8	3908.84 7	(10095.25)	1.56 9
3282.8 [§] 5	6040.67	0.20 5	*3925.35 9		0.80 5
3292.64 [§] 19	5800.80	0.266 25	3932.7 [§] 5	5610.83	0.098 18
3304.17 [§] 15	(10095.25)	0.38 3	3939.9 [§] 3	8200.11	0.25 3
3312.70 14	(10095.25)	0.51 4	3944.8 5	8190.21	0.141 23
3317.59 22	7593.06	0.31 3	*3973.74 16		0.40 3
3325.40 12	(10095.25)	0.50 4	3996.25 6	3996.49	2.50 13
3334.6 [§] 3	4927.83	0.169 21	*4004.50 18		0.296 24
*3362.1 4		0.105 14	4016.40 14	(10095.25)	0.42 3
3366.78 [§] 13	4948.94	0.336 23	4024.41 13	(10095.25)	0.43 3
3379.76 12	7654.93	0.304 20	4041.0 [§] 6	5021.23?	0.068 16
3385.88 [§] 10	6434.51	0.379 24	4054.41 9	(10095.25)	0.75 4
*3399.7 5		0.177 20	4063.0 [§] 3	5655.66	0.143 18
3404.78 15	5912.50	0.45 3	*4088.53 6		0.449 24
3410.75 21	7654.93	0.285 25	4099.69 24	5659.25	0.084 8
3416.8 3	5912.50	0.25 3	*4105.17 9		0.335 19
3421.2 5	7035.28	0.128 23	4117.87 8	6434.51	0.318 18
3437.10 [§] 12	4730.70	0.45 3	4126.14 7	(10095.25)	0.392 21
3455.86 9	4749.47	0.79 5	4142.63 6	(10095.25)	0.61 3
3479.8 [§] 3	4459.72	0.19 3	*4150.83 13		0.131 9
3488.59 ^{be} 21	3489.30	0.82 ^e 10	*4167.05 13		0.149 10
	5655.66	0.82 ^e 10	4175.64 23	6769.77	0.089 8
		0.071 22	4182.54 6	(10095.25)	0.86 5
*3499.8 [‡] 8		0.13 6	*4187.79 10		0.317 19
*3508.2 [‡] 10		0.16 7	*4200.51 9		0.227 13
*3511.3 [‡] 8		0.47 4	4208.05 6	(10095.25)	0.74 4
3520.84 [§] 15	3521.38	0.149 24	*4215.83 9		0.343 20
3529.4 [§] 4	4823.33	0.10 4	4220.63 12	4220.62	0.251 15
3540.8 [§] 9	6782.54	0.45 12	4227.4 3	6394.31	0.089 13
3561.0 5	3560.61				

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⁴⁰K(n,γ) E=thermal 1984Kr05,1971Be05 (continued)

γ(⁴¹K) (continued)

Eγ [†]	E(level)	Iγ ^{†d}	Eγ [†]	E(level)	Iγ ^{†d}
4228.8 3	4228.99	0.109 14	5021.19 17	5021.23?	0.165 12
4238.51 20	6995.53	0.165 14	5073.4 5	(10095.25)	0.096 16
^x 4251.80 18		0.205 16	^x 5083.40 20		0.275 23
4259.73 11	4260.36	0.376 23	5114.5 4	6791.36	0.153 18
4268.34 7	(10095.25)	0.73 4	5146.00 21	(10095.25)	0.37 3
^x 4283.91 8		0.54 3	5151.7 3	8200.11	0.29 3
4294.09 8	(10095.25)	0.55 3	5157.8 [§] 7	6835.43	0.085 18
4302.7 3	4303.01	0.101 12	5167.18 10	(10095.25)	0.81 5
4322.00 [§] 18	7035.28	0.121 10	5203.2 3	6497.00?	0.134 16
^x 4332.02 23		0.097 9	5225.9 4	7938.98	0.117 17
^x 4339.53 9		0.329 19	5232.14 25	(10095.25)	0.223 20
^x 4350.62 24		0.089 9	^x 5249.91 19		0.262 21
4372.6 ^e 5	6070.76	0.108 ^e 13	^x 5260.2 [‡] 10		0.039 13
	8200.11	0.108 ^e 13	5271.54 7	(10095.25)	1.88 10
4380.2 [§] 10	6078.56	0.062 12	^x 5278.9 3		0.111 12
4429.0 5	8190.21	0.065 10	^x 5288.2 4		0.065 10
4435.0 6	(10095.25)	0.54 4	^x 5299.95 21		0.127 12
4439.37 7	(10095.25)	1.20 7	5309.3 5	6290.05	0.053 9
^x 4446.47 17		0.179 13	5319.5 9	6995.53	0.028 9
4459.0 [§] 6	4459.72	0.59 3	5345.65 12	(10095.25)	1.13 8
4465.7 4	6782.54	0.063 9	5349.57 10	(10095.25)	1.56 9
4474.0 7	6791.36	0.032 7	5357.7 3	7035.28	0.43 4
4484.24 11	(10095.25)	0.333 20	5359.0 3	(10095.25)	0.53 5
4489.92 11	(10095.25)	0.388 23	5364.03 12	(10095.25)	0.60 4
4496.0 4	6078.56	0.067 9	^x 5420.46 18		0.244 18
4509.6 3	6186.04	0.142 18	^x 5440.87 14		0.359 24
4519.62 13	(10095.25)	0.47 3	5476.0 ^e 3	6769.77	0.116 ^e 14
4532.7 3	5826.66	0.37 5		7035.28	0.116 ^e 14
4536.7 4	(10095.25)	0.26 4	5485.42 7	(10095.25)	1.61 9
4546.79 8	(10095.25)	1.15 7	^x 5495.88 ^{#e} 8		1.32 ^e 7
4576.65 11	5557.39?	0.200 12	5495.88 ^{#ef} 8	5496.61	1.32 ^e 7
^x 4582.9 3		0.101 10	5510.82 15	7654.93	0.297 20
^x 4587.2 [‡] 8		0.034 9	5526.14 13	(10095.25)	0.369 23
4598.26 6	(10095.25)	0.87 5	5541.64 17	6835.43	0.329 23
4639.50 19	8200.11	0.087 7	5547.91 12	5548.19	0.56 3
4647.89 [§] 17	7361.15?	0.105 8	5568.8 4	(10095.25)	0.149 19
^x 4657.35 7		0.53 3	5573.9 3	5575.24?	0.183 20
4668.25 ^e 24	6835.43	0.099 ^e 9	5604.26 18	5604.58	0.262 19
	8190.21	0.099 ^e 9	5610.3 5	5610.83	0.080 12
4673.52 11	6255.96	0.270 16	5635.26 8	(10095.25)	1.45 8
4696.38 ^e 17	6290.05	0.280 ^e 20	^x 5646.3 4		0.071 10
	6394.31	0.280 ^e 20	5658.9 15	5659.25	0.257 17
4701.3 5	8190.21	0.145 16	^x 5676.90 18		0.203 15
4705.8 8	6290.05	0.056 15	5727.03 22	7020.97	0.75 7
^x 4723.26 9		0.369 21	5749.31 9	(10095.25)	4.06 23
4735.9 [§] 3	4735.86	0.076 9	5776.8 10	7361.15?	0.10 3
4744.6 6	4745.49	0.44 3	5791.75 25	(10095.25)	0.55 5
4749.05 11	4749.47	0.51 3	^x 5806.0 8		0.11 3
4776.65 22	6070.76	0.110 10	5819.99 11	(10095.25)	2.16 13
4796.10 [§] 7	(10095.25)	0.81 4	5834.25 15	(10095.25)	1.04 7
4820.08 18	5800.80	0.167 12	5850.46 13	(10095.25)	1.36 9
^x 4832.47 [‡] 9		0.54 3	5865.66 13	(10095.25)	1.52 10
^x 4855.30 17		0.085 6	5873.60 23	(10095.25)	0.65 6
4862.43 10	4862.43	0.186 11	5930.19 9	(10095.25)	1.23 7
^x 4875.66 16		0.122 8	5948.69 11	(10095.25)	0.65 4
4880.8 [§] 6	7593.06	0.027 5	6068.06 25	(10095.25)	0.174 16
4891.12 14	7035.28	0.098 7	6098.23 7	(10095.25)	5.4 3
4905.3 9	5886.95	0.15 5	6104.2 3	(10095.25)	0.38 4
4910.04 25	(10095.25)	0.63 6	6224.9 3	(10095.25)	0.152 16
^x 4926.2 3		0.33 4	6267.86 11	(10095.25)	0.85 5
^x 4978.6 4		0.150 21	6289.24 21	6290.05	0.272 22
4998.64 [§] 8	(10095.25)	0.60 3	6308.8 8	9740.70	0.049 12
^x 5012.68 11		0.315 19	6319.7 6	(10095.25)	0.88 5

Continued on next page (footnotes at end of table)

⁴⁰K(n,γ) E=thermal 1984Kr05,1971Be05 (continued)

γ(⁴¹K) (continued)

Eγ [†]	E(level)	Iγ ^{†d}	Eγ [†]	E(level)	Iγ ^{†d}
6333.24 9	(10095.25)	1.80 10	7028.03 25	9740.70	0.044 4
^x 6357.9 5		0.097 14	7046.71 19	(10095.25)	0.062 5
6443.17 11	(10095.25)	0.382 22	7337.71 12	(10095.25)	2.04 12
6450.6 4	6450.15 [?]	0.069 8	7381.97 11	(10095.25)	2.33 13
6481.45 21	(10095.25)	0.120 10	7586.57 10	(10095.25)	0.53 3
6522.4 6	8200.11	0.030 5	7599.37 14	(10095.25)	0.244 15
6534.26 22	(10095.25)	0.093 7	7777.89 14	(10095.25)	9.1 6
6560.22 8	(10095.25)	0.64 3	7950.70 13	(10095.25)	2.78 17
6573.41 13	(10095.25)	0.203 12	8396.41 12	(10095.25)	0.183 10
^x 6588.1 8		0.022 5	8417.05 19	(10095.25)	0.112 9
6606.1 [§] 3	(10095.25)	0.085 7	8445.5 7	9740.70	0.009 2
6644.90 15	7938.98	0.306 20	^x 8469.5 7		0.010 2
6662.85 10	(10095.25)	0.82 5	8512.31 14	(10095.25)	0.202 21
6853.9 3	(10095.25)	0.37 4	8800.55 13	(10095.25)	1.02 7
6859.4 5	(10095.25)	0.22 3			
6881.05 10	(10095.25)	1.63 9			
6952.26 10	(10095.25)	1.97 11			

[†] From 1984Kr05. Iγ includes systematic uncertainty of 15% below 1.5 MeV, 10% between 1.5 and 3.0 MeV and 5% above 3 MeV.

[‡] This γ has either multiple placements or very improbable placement on the basis of Jπ and intensity arguments (1984Kr05).

[§] Multiple placement is possible but the given placement is favored by Jπ and intensity arguments (1984Kr05).

[#] Assumed (1984Kr05) as doublet, one component from 5496 level, the other remains unidentified. However, the level scheme of 1984Kr05 does not show a g.s. transition from 5496 level. The evaluators have placed this γ from 5496 based on comment by 1984Kr05.

[@] Placement is questionable since the branching ratios in (n,γ) (1984Kr05) and (n,n'γ) (1987Kr01) disagree.

[&] May deexcite a 3579 level as proposed by 1986Bi03 in (p,γ).

^a Placement questioned by 1986Bi03 and/or 1986Sm13 in (p,γ); since this γ was not seen in their singles γ or γγ coin spectra, as expected from significant branching reported by 1984Kr05.

^b Placement proposed by 1986Sm13 in (p,γ).

^c Part (=25%) of this γ ray may deexcite 3489 level as in (p,γ).

^d Absolute intensity per 100 neutron captures.

^e Multiply placed; undivided intensity given.

^f Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

⁴⁰K(n,p),(n,α): Resonances 1981We12

1981We12: E(n)=0.02 eV to 70 keV. Measured Ep, Ip, Eα, Iα using gold-silicon surface barrier detector. Neutron energies measured by tof method. For neutrons, FWHM=5.1 eV at 1 keV and 35 eV at 5 keV. See also 1981Em03 from the same group for E=thermal, where Eα=3492 keV 7 and E(p)=2233 keV 3 were reported from the capture state to ground states of residual nuclides. 19 other α groups were also reported by 1981Em03 from 2180-3310 keV.

⁴¹K Levels

E(level) [†]	Jπ [‡]	gΓ _n Γ _{α0} /Γ	E(n)(lab) in keV [§]	gΓ _n Γ _p /Γ (eV)	Comments
10096.5	9/2 ^{-a}	0.043 eV 4	1.128	<0.0003	
10097.6		0.0280 eV 25	2.291	<0.0006	
10098.4	+&	0.00100 eV 25	3.060	0.0130 15	
10100.3		@	5.038		
10100.4	9/2 ^{-a}	1.10 eV [#] 9	5.177	<0.0003	
10100.8			5.60		
10101.0			5.73		
10101.2		0.011 eV 5	5.98	0.0310 35	
10101.4		0.039 eV 5	6.21	0.0035 10	
10101.8?		<0.002 eV	6.6	0.005 2	
10102.4		0.0075 eV 15	7.15	<0.0005	
10103.1		0.0160 eV 25	7.87	0.0010 5	
10103.3		0.034 eV 4	8.10	<0.001	
10104.6	(+)&	0.0060 eV 15	9.42	0.0090 15	

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${}^{40}\text{K}(\text{n},\text{p}),(\text{n},\alpha)$: Resonances 1981We12 (continued) **${}^{41}\text{K}$ Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	$g\Gamma_n\Gamma_{\alpha 0}/\Gamma$	E(n)(lab) in keV [§]	$g\Gamma_n\Gamma_p/\Gamma$ (eV)	Comments
10105.5	(+)&	0.0090 eV 25	10.4	0.0100 25	
10106.8	(+)&	0.038 eV 6	11.7	0.0150 15	
10107.3		0.012 eV 2	12.2	<0.001	
10107.8		0.112 eV 12	12.7	<0.005	
10110.3	(+)&	0.030 eV 5	15.3	0.0070 25	
10110.7?			15.7		
10111.3		0.010 eV 3	16.3	<0.005	
10112.0		0.032 eV 6	17.0	<0.002	
10114.2		0.032 eV 6	19.3	<0.003	
10115.8	7/2(+), 9/2+	0.27 eV 3	20.9	0.017 5	$J\pi$: from comparison of α and proton yield to estimated spin dependent values.
10117.2			22.4		
10118.1			23.3		
10118.5			23.7		
10119.4			24.6		
10121.3?			26.6		
10123.1			28.4		
10124.2?			29.5		
10125.9			31.3		
10131.9			37.4		
10136.4			42.0		
10139.2			44.9		
10142.1			47.9		
10147.3			53.2		
10152.5			58.5		
10163?			69		

[†] From $S(\text{n})({}^{41}\text{K})+\text{E}(\text{n})(\text{c.m.})$, where $S(\text{n})({}^{41}\text{K})=10095.37\ 6$ (2012Wa38). Uncertainty in $\text{E}(\text{n})$ is 0.1–0.2 keV.

[‡] From 1981We12 from spin dependence of proton and neutron widths.

[§] Uncertainties seem to be from 0.01 keV at 3 keV to 0.07 keV at 11.7 keV.

For 5.038+5.177, but at least 80% is in 5.177 resonance.

@ See comment for 5.177 resonance.

& Moderate proton yield indicates p wave resonance.

^a s-wave resonance since no protons are observed. $g\Gamma_n\Gamma_p/\Gamma$ three orders of magnitude below estimated value for $J\pi=7/2-$.

 ${}^{41}\text{K}(\text{e},\text{e}')$ 1981Gr04

1981Gr04: $\text{E}=40\text{--}66$ MeV. Measured $\sigma(\theta)$ using high resolution energy-loss electron spectrometer (FWHM = 35 keV); deduced $\text{B}(\text{E}2)$.

 ${}^{41}\text{K}$ Levels

E(level)	$J\pi^{\dagger}$	Comments
0.0	3/2+	
980	1/2+	$\text{B}(\text{E}2)\uparrow=0.0024\ 4$ (1981Gr04). $\text{B}(\text{E}2)\uparrow$: other: 0.0034 13 (quoted by 1978En02 from Richter, Darmstadt Report IKDA 1978). Using mean lifetime of 440 fs 40, 1981Gr04 deduce $\text{B}(\text{M}1)(\uparrow)=0.067\ 6$.

[†] From the Adopted Levels.

$^{41}\text{K}(\text{n},\text{n}'\gamma)$ 1987Kr01

1987Kr01: E=fast reactor neutrons. Measured E_γ and I_γ using Ge(Li) detector.

Other: 1968Ni01: E=2.6–4.0 MeV neutrons produced via the t(p,n) reaction. Measured E_γ with Ge(Li) detector and I_γ , excitation functions and $\gamma(\theta)$ using anticompton spectrometer consisting of a central NaI(Tl) crystal surrounded by an annular NaI(Tl) crystal. Data for levels up to 1677 keV.

 ^{41}K Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	Comments
0.0	$3/2^+$	
980.51 10	$1/2^+$	$J\pi$: 1/2,3/2 from $\gamma(\theta)$ and production cross sections (1968Ni01).
1293.63 10	$7/2^-$	$J\pi$: 7/2 from $\gamma(\theta)$ and production cross sections (1968Ni01).
1559.97 9	$3/2^+$	
1582.01 10	$3/2^-$	$J\pi$: 9/2,11/2 from $\gamma(\theta)$ and production cross sections (1968Ni01).
1593.11 23	$1/2^+$	
1677.19 9	$7/2^+$	
1697.91 10	$5/2^+$	
2143.54 24	$5/2^+$	
2166.6 5	$3/2^-$	
2316.4 15	$5/2^-$	
2440.048 20	$(3/2, 5/2^+)$	
2508.13 16	$7/2^+$	
2711.3 5	$3/2^+, 5/2^+$	
2712.64 19	$(7/2)^-$	
2756.89 24	$5/2^+$	
2761.7 23	$11/2^-$	
3047.6 10	$1/2^-, 3/2^-$	
3142.6 5	$5/2^-$	
3213.4 3	$5/2^-$	
3450.0 7	$5/2^-, 7/2^-$	
3489.7 7	$(5/2)^+$	
3572.1 10		
3578.3 4	$(3/2^+, 5/2, 7/2^+)$	
3653.2 7	$(5/2, 7/2^-)$	
3762.0 9		
3828.0 15	$(5/2, 7/2^+)$	
3998.3 11	$(5/2^+)$	
4220.0 6	$(5/2)$	
4229.0 11	$(5/2)^-$	
4302.6 11	$(5/2^+, 7/2^+)$	
4346.3 17	$(5/2, 7/2^-)$	
5083.6? 5		
5129.4? 5		
5496.7 11	$(7/2^+)$	
5654.2 6	$(3/2^-, 5/2^+)$	
5914.2 25	$(9/2^+)$	$E(\text{level})$: likely the same level as 5912.5 in (n, γ) E=th.
6039.0 6		

† From a least-squares fit to E_γ 's, by evaluators.

‡ From the Adopted Levels.

 $\gamma(^{41}\text{K})$

E_γ	$E(\text{level})$	I_γ	Comments
980.5 1	980.51	236 28	$A_2=0.00$ 6 (1968Ni01).
1293.6 1	1293.63	224 22	$A_2=0.26$ 3 (1968Ni01).
1418.98 16	2712.64	12.6 8	
1463.9 9	2756.89	2.5 8	
1468.0 23	2761.7	7.6 6	
1559.94 9	1559.97	100 3	
1581.99 10	1582.01	85 3	
1593.08 † 23	1593.11	28.4 24	
1632.6 † @ 9	3213.4	3.1 9	E_γ : branching ratio in disagreement with (n, γ) suggesting alternate placement (1987Kr01).
1677.14 9	1677.19	162 4	
1697.88 10	1697.91	124 4	

Continued on next page (footnotes at end of table)

$^{41}\text{K}(\text{n},\text{n}'\gamma)$ 1987Kr01 (continued) $\gamma(^{41}\text{K})$ (continued)

$E\gamma$	$E(\text{level})$	$I\gamma$	$E\gamma$	$E(\text{level})$	$I\gamma$	$E\gamma$	$E(\text{level})$	$I\gamma$
$^{*}1824.5\ 9$		2.9 9	$^{*}2529.5\ 10$		1.4 3	$3500.5^{\textcircled{a}}\ 11$	5083.6?	1.2 3
$^{*}1832.1\ 20$		1.3 9	$^{*}2533.5^{\ddagger}\ 11$		0.8 4	$3761.8\ 9$	3762.0	1.8 4
$^{*}1842.6\ 9$		3.0 9	$2604.6\ 11$	4302.6	1.5 13	$^{*}3778.5\ 8$		3.6 6
$1848.9\ 4$	3142.6	7.3 9	$^{*}2682.8^{\ddagger}\ 11$		1.5 8	$^{*}3809.5\ 10$		1.7 3
$1880.6\ 6$	3578.3	2.6 5	$2711.2\ 5$	2711.3	3.7 5	$^{*}3820.3\ 16$		1.4 4
$1894.9^{\#}\ 10$	3572.1	1.9 6	$^{*}2720.2\ 3$		1.7 5	$3827.8^{\dagger}\ 15$	3828.0	1.5 4
$1900.0\ 9$	3578.3	2.3 6	$^{*}2735.9\ 9$		1.8 4	$3835.6\ 11$	5129.4?	1.1 3
$1919.6\ 3$	3213.4	4.6 5	$^{*}2750.9\ 13$		2.0 6	$^{*}3868.8\ 11$		0.9 3
$1976.0^{\S}\ 7$	3653.2	11 3	$2756.74\ 25$	2756.89	9.4 6	$^{*}3941.5\ 11$		0.8 4
$2018.3\ 4$	3578.3	1.5 2	$2767.4^{\textcircled{a}}\ 9$	5083.6?	1.9 4	$^{*}3962.8\ 25$		0.8 4
$^{*}2061.2\ 7$		2.7 6	$2784.0\ 10$	5496.7	1.6 4	$3998.1\ 11$	3998.3	1.1 3
$^{*}2102.7\ 6$		3.9 7	$2813.1^{\textcircled{a}}\ 6$	5129.4?	4.3 6	$^{*}4011.0\ 5$		3.0 3
$2143.48^{\S}\ 24$	2143.54	26 3	$^{*}2896.5\ 9$		2.7 5	$^{*}4022.4\ 15$		1.0 2
$2156.3^{\#}\ 7$	3450.0	8.0 18	$2935.3\ 11$	4229.0	1.9 7	$^{*}4047.7\ 11$		1.8 4
$2166.5\ 5$	2166.6	12.9 18	$3047.5^{\dagger}\ 10$	3047.6	1.6 4	$^{*}4326.2\ 15$		1.1 4
$2196.0^{\dagger}\ 7$	3489.7	1.7 4	$3052.5^{\dagger}\ 17$	4346.3	0.9 4	$^{*}4337.1\ 14$		1.3 4
$^{*}2371.4^{\ddagger}$		1.9 5	$^{*}3070.8\ 11$		2.5 6	$^{*}4361.1\ 3$		1.6 1
$2439.97^{\S\#}\ 2$	2440.048	11.6 7	$3152.4^{\dagger}\ 9$	5914.2	3.9 8	$^{*}4673.9\ 8$		2.2 4
$^{*}2454.9\ 7$		3.4 7	$3180.2\ 11$	5496.7	5.1 9	$^{*}4711.8\ 11$		1.3 3
$^{*}2483.2\ 10$		3.0 7	$^{*}3226.5\ 11$		2.3 11	$^{*}4761.2\ 7$		3.1 4
$^{*}2490.0^{\ddagger}\ 9$		1.0 7	$3282.0^{\dagger}\ 5$	6039.0	1.6 2	$^{*}4801.2\ 5$		4.6 4
$2508.05\ 16$	2508.13	8.3 3	$^{*}3290.5\ 5$		1.6 2	$^{*}4917.0\ 9$		4.1 8
$2522.0\ 6$	4220.0	2.4 3	$3487.5^{\dagger}\ 3$	5654.2	3.3 9	$^{*}5025.8\ 11$		2.6 8

† Multiple placement is possible, based on results from (n, γ).

‡ Tentative placement suggested with 5083.6 or 5129.4 level would need additional final level.

§ Probable doublet.

$^{\#}$ Based on agreement with results from (p, γ), 1987Kr01 suggest that these are not primary γ -ray transitions, as assigned in (n, γ), E=thermal.

$^{\textcircled{a}}$ Placement of transition in the level scheme is uncertain.

* γ ray not placed in level scheme.

$^{41}\text{K}(\text{n},\text{n}'\gamma)$ 1987Kr01 (continued)

Level Scheme

Intensities: relative I_γ $^{41}_{19}\text{K}_{22}$ **$^{41}\text{K}(\text{p},\text{p}'\gamma), (\text{p},\text{p}')$ 1986St10**

1986St10: E=6.2 MeV. Measured E_γ , I_γ , $p\gamma$ coincidences using Si surface-barrier detector and Ge(Li) detector; lifetimes by DSAM and $\gamma\gamma(t)$. Hauser-Feshbach analysis of (p,p') and $(\text{p},\text{p}'\gamma)$ reaction cross sections.

Others:

1980Sa14: E=3.22 MeV. Measured E_γ , I_γ using Ge(Li) detector; deduced $T_{1/2}$ of 1582-keV level by direct timing.

1977Ay01: E=4.7 MeV. Measured $p\gamma(\theta, \text{H}, t)$ using annular solid state detector and NaI detector; deduced hyperfine fields and lifetime of 1294 level.

1977Li22: E=6.0 MeV. Measured E_γ , I_γ using Ge(Li) detector; deduced lifetime of 980 level by DSAM.

1974Ko10: E=6.8 MeV. Measured $\gamma(\theta, \text{H}, t)$, deduced magnetic moment of 1294 level.

1971Ju04: E=5.3–5.8 MeV. Measured E_γ , I_γ , $p\gamma$ coin using solid state detector and Ge(Li) detector. (p,p') measured with a broad range magnetic spectrograph. Proton spectrum in Fig. 5, with 14 proton group labeled with energies from 980 to 2600 keV is in excellent agreement with levels reported here.

1969Bl07: E=5.3 MeV. Measured $p\gamma(\theta, \text{H}, t)$, deduced g factor and lifetime of 1294 level.

1958Sh70: E=3.04 MeV. Measured E_γ , $p\gamma$ coin.

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$^{41}\text{K}(\text{p},\text{p}'\gamma),(\text{p},\text{p}') \quad 1986\text{St10 (continued)}$

1958En52: (p,p') E=6.5 MeV. 19 proton groups reported from 978 to 3280 keV, energies of which agree well with those reported here from more recent measurements. Some of details apparently were given in an MIT-LNS Prog. rept., 111 (May 1959). This report is no longer available.

 ^{41}K Levels

E(level) [†]	Jπ [‡]	T _{1/2} [§]	σ _γ (relative) [#]	Comments
0.0	3/2+			
980.42 10	1/2+	>2.4 ps		T _{1/2} : other: >2.0 ps (1977Li22). E(level): from 1971Ju04.
1293.9 4	7/2-	7.35 ns 20		σ _p =2.5 6. μ=+4.41 5 (1969Bl07). T _{1/2} : weighted average of 8.04 ns 35 (1986St10), 7.14 ns 35 (1977Ay01), 7.1 ns 3 (1974Ko10), 7.3 ns 2 (1969Bl07).
1560.3 4	3/2+	0.49 ps 14	4.3 7	σ _p =4.9 6. σ _p =8.9 12 for 1560+1582+1594 triplet.
1582.3 4	3/2-	>2.8 ps	4.1 7	T _{1/2} : <26 ps (1980Sa14).
1593.6 6	1/2+	0.13 ps 5	1.5 4	Jπ: Hauser-Feshbach analysis allows 1/2- also.
1677.5 5	7/2+	1.25 ps 35	3.2 4	σ _p =7.0 10 for 1678+1698 doublet.
1698.0 5	5/2+	0.83 ps 21	3.7 5	
2143.6 6	3/2+, 5/2+	0.21 ps 6	2.6 4	Jπ: adopted Jπ=5/2+. σ _p =6.2 11 for 2144+2167 doublet.
2166.8 6	3/2-	0.22 ps 8	3.6 6	
2317.0 6	5/2-	0.59 ps 14	3.2 4	σ _p =2.9 4.
2439.9 8	(3/2, 5/2+)	83 fs 35	2.6 4	Jπ: Hauser-Feshbach analysis gives 3/2,5/2,7/2, but 5/2- and 7/2 are excluded due to unacceptably large transition strengths. 5/2+ is also less likely from E2 transition strength.
2494.9 9	9/2+	>2.8 ps	1.6 2	σ _p =1.9 3.
2508.3 6	7/2+	0.15 ps 4	1.9 2	σ _p =3.5 4 for 2495+2508 doublet.
2595.0 10	1/2-		1.2 3	σ _p =1.1 3. Jπ: adopted Jπ=1/2-, 3/2-.
2676.1 7	1/2+		0.73 18	
2713.0 6	3/2-, 7/2-	0.59 ps 28	2.1 3	Jπ: adopted Jπ=(7/2)-.
2756.0 6	3/2+	52 fs 21	1.12 19	Jπ: adopted Jπ=5/2+.
2760.8 6	11/2-	0.53 ps 21	0.58 6	
3047.7 9	1/2-		0.73 18	Jπ: adopted Jπ=1/2-, 3/2-.
3142.6@ 7	5/2-	0.12 ps 8	1.26 18	T _{1/2} : from DSAM of 1849γ.
3162.2 8	1/2	<21 fs	0.47 12	
3214.3 7	5/2, 7/2, 3/2-	0.13 ps 6	1.22 20	Jπ: 3/2- is less likely from transition strength. Adopted Jπ=5/2-.
3236.1 8	(3/2-, 5/2, 7/2)	38 fs 35	0.97 16	Jπ: 3/2- and 9/2- are allowed by Hauser-Feshbach analysis but 9/2- is unacceptable and 3/2- is less likely from transition strengths.
3281.7 7	(1/2, 3/2, 5/2+)	76 fs 69	0.64 16	

[†] From 1986St10, except where noted.

[‡] From Hauser-Feshbach analysis of (p,p') and (p,p'γ) cross sections (1986St10).

[§] From DSAM (1986St10), except where noted.

[#] Total relative cross section from (p,p'γ). (1986St10). Relative cross sections from (p,p') are given under comments.

@ According to adopted levels, there are two levels near this energy, one depopulated by 634γ and the other by 1849γ.

 $\gamma(^{41}\text{K})$

E(level)	Eγ [†]	Iγ [‡]	E(level)	Eγ [†]	Iγ [‡]	E(level)	Eγ [†]	Iγ [‡]
980.42	980.4	100	1593.6	300.4 § c	<17 §	1698.0	1698.0	100
1293.9	1293.9	100		613.2	40	2143.6	446.1	5.1
1560.3	266.3 § c	<2 §		1593.6	60 &		467.1 § c	<13 §
	579.9	19.9 7	1677.5	383.5 § c	<10 §		550.1 § c	<12 §
	1560.3	80.1 # 15		696.7 § c	<5 §		562.1 § c	<15 §
1582.3	288.4 § c	<2 §		1677.5	100		583.3	13.6
	601.9	19.6	1698.0	404.5 § c	<9 §		850.5 § c	<12 §
	1582.3	80.4 @ 16		717.7 § c	<10 §		1163.2	8.4

Continued on next page (footnotes at end of table)

$^{41}\text{K}(\text{p,p}'\gamma),(\text{p,p}')$ 1986St10 (continued) $\gamma(^{41}\text{K})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\ddagger$	E(level)	$E\gamma^\dagger$	$I\gamma^\ddagger$	E(level)	$E\gamma^\dagger$	$I\gamma^\ddagger$
2143.6	2143.5	72.9 ^a	2494.9	796.9	18.1	2760.8	1466.9	100
2166.8	467.9 ^{§c}	<25 [§]		817.4	42.0 19	3047.7	1454.1	33
	489.0 ^{§c}	<25 [§]		1201.0	39.9 17		2067.2	19
	572.0 ^{§c}	<24 [§]	2508.3	830.8	48.0 17		3047.6	48
	584.5	30.1 ^b		1214.4	11	3142.6	634.3	45
	606.1 ^{§c}	<25 [§]		2508.2	41		1848.7	55
	872.4 ^{§c}	<25 [§]	2595.0	1012.7	91	3162.2	3162.1	100
	1186.4	35.7 11		2594.9	9	3214.3	1920.4	100
	2166.7	34.2 ^b	2676.1	1115.8	64	3236.1	919.1	34
2317.0	734.7	5.5 7		2676.0	36		1942.2	66
	1023.1	94.5 20	2713.0	396.0	12.5 7	3281.7	2301.2	58
2439.9	741.9	14.4		1130.7	21.9		3281.6	42
	879.6	6.2		1419.1	65.6 18			
	1459.5	16.6	2756.0	612.4	29			
2439.8	62.8			2755.9	71			

[†] From level-energy differences, with recoil removed.

[‡] From 1986St10, except where noted.

[§] From 1971Ju04.

$I\gamma(1560)/I\gamma(580)=87\ 4/13\ 3$ (1971Ju04).

@ $I\gamma(1582)/I\gamma(602)=90\ 4/10\ 2$ (1971Ju04).

& $I\gamma(1594)/I\gamma(613)=61\ 8/39\ 8$ (1971Ju04).

^a $I\gamma(2143):I\gamma(1163):I\gamma(583):I\gamma(446)=46\ 7:14\ 4:26\ 6:14\ 6$ (1971Ju04).

^b $I\gamma(2167):I\gamma(1186):I\gamma(584)=26\ 8:34\ 7:=16$ (1971Ju04).

^c Placement of transition in the level scheme is uncertain.

Level Scheme

Intensities: % photon branching from each level

⁴¹K(p,p')(p,p') 1986St10 (continued)

Coulomb Excitation 1968An20,1977Li22

1968An20: ($^{20}\text{Ne}, ^{20}\text{Ne}'\gamma$) with $E(^{20}\text{Ne})=35$ MeV. Measured $E\gamma$, $I\gamma$ using NaI(Tl) crystal; deduced $B(E2)$ relative to $B(E2)$ for g.s. to 1630-keV level in ^{20}Ne .

1977Li22: ($^{16}\text{O}, ^{16}\text{O}'\gamma$) with $E(^{16}\text{O})=22, 24$ MeV. Measured $E\gamma$, $I\gamma$ using Compton-suppressed Ge(Li) detector; deduced $B(E2)$ relative to $B(E2)$ for g.s. to 203 level in ^{127}I .

 ^{41}K Levels

E(level) [†]	$J\pi^{\dagger}$	Comments
0.0	3/2+	
980.5	1/2+	<p>$B(E2)\uparrow=0.0029$ 10 (1968An20); $B(E2)\uparrow=0.0139$ 20 (1977Li22).</p> <p>$B(E2)\uparrow$: values of 1968An20 and 1977Li20 have been adjusted by the evaluators to account for a change in the $B(E2)$ value of the normalizing transitions. 1968An20 normalize to $B(E2)(\uparrow)=0.024$ for the g.s. to 1630-keV level in ^{20}Ne, the value is now known to be 0.033. 1977Li20 normalize to $B(E2)(\uparrow)=11.3$ W.u. for the g.s. to 203 level in ^{127}I, the value is now known to be 13.3.</p> <p>$B(E2)\uparrow$: value from 1977Li22 deduced from $B(E2)(\text{W.u.})(\uparrow)=1.4$ 2 (1977Li22).</p>

[†] From the Adopted Levels.

 $\gamma(^{41}\text{K})$

$E\gamma$	E(level)	Mult.	δ	Comments
980	980.5	M1+E2	0.13 2	<p>Mult., δ: from the Adopted Gammas.</p> <p>δ: other: 0.34 5 is derived by 1977Li22 by combining their $B(E2)(\text{W.u.})(\downarrow)=2.8$ 4 value measured in a Coulex experiment with a half-life of 5.0 ps 15 measured in a Doppler Shift Attenuation method (DSAM) experiment.</p>

Level Scheme **$^{42}\text{Ca}(\mu^-, \nu n \gamma)$ 2006Me08**

μ^- beam obtained from decay of π^- beam at 90 MeV/c. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using two HPGe detectors.

 ^{41}K Levels

E(level) [†]	$J\pi^{\dagger}$
0.0	3/2+
980.5	1/2+
1293.6	7/2-

[†] From the Adopted Levels.

⁴²Ca(μ⁻,νγ) 2006Me08 (continued)

γ(⁴¹K)

Eγ	E(level)	Iγ [†]	Comments
980.5	980.5	0.14 7	
1293.6	1293.6		Iγ: intensity not listed by 2006Me08, peak is overlapped by other transitions.

[†] Percent γ-ray yield.

Level Scheme

Intensities: relative
Iγ

⁴²Ca(d,³He) 1976Do05

1976Do05: E(d)=52 MeV. Measured σ(θ) for θ=8° to 30° using counter telescopes consisting of ΔE and E surface barrier detectors (FWHM=120 keV); DWBA analysis.

1969Yn01: E(d)=21.4 MeV. Measured σ(θ) for θ=12° to 30° using magnetic analysis and ΔE-E telescope of surface-barrier detectors (FWHM=70-130 keV); DWBA analysis.

⁴¹K Levels

E(level) [†]	L [‡]	C ² S [§] #	Comments
0.0	2	3.43	C ² S: other: 3.3 (1969Yn01).
980 20	0	0.77	E(level): other: 980 40 (1969Yn01). C ² S: other: 0.9 (1969Yn01).
1290 20	3	0.93	E(level): 1969Yn01 report two levels 1270 40 with L=0 and 1290 40 with L=(3). C ² S: other: 0.17 for L=0, fit improves if an L=3 component with C ² S=0.36 is included (1969Yn01).
1570 20	0+1+2		E(level): triplet of 1560+1582+1593 levels. C ² S: 0.17 for L=0 (1593 level); 0.10 for L=1 (1582), 0.16 for L=2 (1560 level) (1976Do05). C ² S=0.4 fit with L=0 for the multiplet (1969Yn01).
2670 20	0	0.64	E(level): other: 1590 40 (1969Yn01). E(level): other: 2730 40 (1969Yn01). C ² S: other: 0.65 (1969Yn01).
3190 20	2	0.21	E(level): probable doublet or triplet.
3480 20	2	0.81	E(level): other: 3570 40 (1969Yn01). C ² S: other: 1.0 (1969Yn01).
4400 20	2	0.23	
4900 20	2	0.42	
5060 20	2	0.57	
5540 20	2	0.45	
5840 20	2	0.48	
6500 20	2	0.37	
6630 20	2	0.22	
8000 20	(2)	0.2	

[†] From 1976Do05. Level energies for 6 groups from 1969Yn01 are included in the comments.

[‡] From DWBA calculations.

[§] From fitting experimental data in the forward maximum with σ_{exp}=NC²Sσ_{DWBA} with N=2.95. In the DWBA calculations, the following orbitals were assumed: 2s_{1/2} for L=0, 2p_{3/2} for L=1, 1d_{5/2} for L=2 except for the ground state where 1d_{3/2} was assumed, and 1f_{7/2} for L=3.

Footnotes continued on next page

$^{42}\text{Ca}(\text{d},^3\text{He})$ 1976Do05 (continued) **^{41}K Levels (continued)**

1978En02 quote S values for first six groups, adjusted upwards by $\approx 35\%$ based on standardized normalization factors as in 1977En02. Higher levels are considered by 1978En02 as unresolved structures.

 $^{42}\text{Ca}(\text{t},\alpha)$ 1968Sa09

1968Sa09: $E(\text{t})=12.8$ MeV. Measured $\sigma(\theta)$ with $\theta=12.5^\circ$ to 87.5° using multi-angle spectrograph and Ilford K1 emulsions (FWHM=30 keV); DWBA analysis.

Other: 1978En02 quote values which are renormalized to $S=4.5$ for the ground state.

 ^{41}K Levels

E(level)	$L^\dagger$	$S^\ddagger$	Comments
0.0	2	2.5	$d\sigma/d\Omega=1.2$ mb/sr I (at 20°).
982 10	0	0.71	
1301 10	3	0.39	
1594 10	0+2	0.2, 0.3	S: approximate values for a doublet.
1703 10	(2)	0.11	
2447 10	(0, 2)		
2674 10	(0)	0.34	
2755 10			
3233 10			
3491 10	(2)	0.38	
4075 10			

† From comparison to DWBA predictions and empirical systematics.

‡ From DWBA analysis using $d\sigma/d\omega_{\text{exp}} = N S \sigma_{\text{DWBA}}(\theta)$ and taking $N=45$. Normalization is determined by requiring that the $^{48}\text{Ca}(\text{t},\alpha)^{47}\text{K}$ 359 keV transition contains the full shell-model $d_{3/2}$ strength of 4.0. It is assumed that $l=0$ transitions are $2s_{1/2}$, $l=2$ transitions are $1d_{3/2}$ and $l=3$ transitions are $1f_{7/2}$ in character.

 $^{42}\text{Ca}(^{13}\text{C},^{14}\text{N})$ 1976Bo01

1976Bo01: $E(^{13}\text{C})=68$ MeV. Measured $\sigma(\theta)$ for ground state using two silicon-surface barrier ΔE - E telescopes separated by 15° and with $\approx 0.2^\circ$ angular resolution; DWBA analysis.

 ^{41}K Levels

E(level)	L	Comments
0.0	1	L: $L=1$ dominates (1976Bo01) but DWBA code LOLA fits the $\sigma(\theta)$ distribution poorly, in particular the experimental oscillations are out of phase with the predicted angular shape. Analysis of $\sigma(\theta)$ distribution of 1976Bo01 by 1977Fu07 suggest that fit is improved by including spin-flip (helicity) contribution.

 $^{44}\text{Ca}(\text{p},\alpha),(\text{p},\alpha\gamma)$ 1971MaXU

1971MaXU (also 1971MaXT, 1972MaXL): (p,α) $E=56.6$ MeV. Measured $\sigma(\theta)$ from 10° - 50° and cross sections.

Others:

1972Gr04: $E=4.235$ MeV. Measured lifetime for 980 level by DSAM.

1976BhZX: (p,α) $E=35$ MeV. Measured $\sigma(\theta)$.

1977Li22: $(\text{p},\alpha\gamma)$ $E=4.235$ MeV. No γ rays near 980 observed.

 ^{41}K Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	L	$d\sigma/d\Omega$ ($\mu\text{b/sr}$) (at 20°)	Comments
0.0	$3/2^+$		2	11.6	

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$^{44}\text{Ca}(\text{p},\alpha),(\text{p},\alpha\gamma)$ 1971MaXU (continued) ^{41}K Levels (continued)

E(level)	$J\pi^\dagger$	$T_{1/2}$	L	$d\sigma/d\Omega$ ($\mu\text{b/sr}$) (at 20°)	Comments
980 30	1/2+	0.28 ps +28-14	0	6.0	$T_{1/2}$: from 1972Gr04. 1977Li22 consider this measurement as questionable since no 980 γ was observed in their $^{44}\text{Ca}(\text{p},\alpha\gamma)$ spectrum.
1290 30			3	15.0	
1600 30			0+2	5.9	E(level): doublet.
2140 30			(2,3)	2.8	
2730 30			(2,3)	12.4	
3470 30			2	35.2	
4280 30			(>3)	18.9	
4900 30				11.0	
5120 30				14.5	
5540 30			(>3)	14.0	
8390 50	5/2-, 7/2-		3	32.7	E(level): IAR of g.s., 7/2- in ^{41}Ar .
9420 50	3/2+, 5/2+		2	13.3	E(level): IAR of 1035, 3/2+ in ^{41}Ar .
12220 50	3/2+, 5/2+		2	18.4	E(level): IAR of 3592, (3/2,5/2)+ in ^{41}Ar .

† From L-transfers and adopted levels.

 $\gamma(^{41}\text{K})$

E_γ	E(level)	Comments
980	980	E_γ : assignment considered as questionable by 1977Li22.

Adopted Levels, Gammas

Q(β⁻)=-6495.48 16; S(n)=8362.82 14; S(p)=8891.37 15; Q(α)=-6615.15 25 2012Wa38.

⁴¹Ca Levels

Cross Reference (XREF) Flags

A ⁴¹Sc ε Decay (596.3 ms)
 B (HI,xnγ)
 C ³⁸Ar(α,nγ)
 D ³⁹K(⁷Li,αnγ), ⁴⁰Ca(³He,2pγ)
 E ⁴⁰Ca(α,2pnγ)
 F ⁴⁰Ca(n,γ),(pol n,γ) E=thermal
 G ⁴⁰Ca(n,γ)
 H ³⁹K(³He,p)
 I ³⁹K(³He,pγ)
 J ³⁹K(α,d)
 K ⁴⁰K(d,n)
 L ⁴⁰K(³He,d)
 M ⁴¹K(p,nγ)
 N ⁴¹K(³He,t)

O Others:
⁴⁰Ca(pol d,p),(d,p)
⁴⁰Ca(d,pγ), ²H(⁴⁰Ca,pγ)
⁴⁰Ca(t,d)
⁴⁰Ca(α,³He)
⁴⁰Ca(p,π⁺),(pol p,π⁺)
⁴¹Ca(p,p')
⁴¹Ca(α,α')
⁴²Ca(p,d)
⁴²Ca(d,t)
⁴²Ca(³He,α)
⁴²Ca(³He,αγ)
⁴³Ca(p,t)
⁴⁰Ca(⁷Li,⁶Li)

⁴⁰Ca(⁹Be,⁸Be)
⁴⁰Ca(¹¹B,¹⁰B)
⁴⁰Ca(¹²C,¹¹C)
⁴⁰Ca(¹³C,¹²C)
⁴⁰Ca(¹⁴C,¹³C)
⁴⁰Ca(¹⁴N,¹³N)
⁴⁰Ca(¹⁷O,¹⁶O)
⁴⁰Ca(¹⁸O,¹⁷O)
⁴⁰Ca(²⁸Si,²⁷Si)
⁴⁰Ca(³²S,³¹S)
⁴²Ca(⁴⁸Ti,⁴⁹Ti)
⁴¹Ca(e,e)
⁴⁰Ca(n,n): Resonances

E(level) [†]	Jπ [‡]	XREF	T _{1/2}	Comments
0.0	7/2-	ABCDEFGHIJKLMNO	9.94×10 ⁴ y 15	Jπ: from L(d,p)=3 and (pol d,p); configuration=πf7/2. %ε=100; Q=-0.0665 18 (2008Py01); μ=-1.594781 9 (1962Br30). μ,Q: See compilation in 2014StZZ and recommended Q in 2013StZZ. T _{1/2} : From a combination of methods consisting of triple-to-double coincidence ratios method (TDCR) with the liquid scintillation counting and the thermal ionization mass spectrometry (TIMS) with isotope dilution for absolute isotopic composition (2012Jo04). Others: 1.03×10 ⁵ y 7 (1991Kl06, 1990Fi13), 1.01×10 ⁵ y 10 (1991Pa10), 1.03×10 ⁵ y 4 (1989Ku33), 1.03×10 ⁵ y 4 (1974Ma30) revised to 1.14×10 ⁵ y 5 by 1991Kl06, 1.3×10 ⁵ y 2 (1972Em01), 0.75×10 ⁵ y 11 (1962Dr02) revised to 1.60×10 ⁵ y 30 by 1991Kl06, 1.1×10 ⁵ y 3 (1953Br71) revised to 1.90×10 ⁵ y 60 by 1991Kl06.
1942.88 17	3/2-a	CD FGHI M o	0.42 ps 5	T _{1/2} : weighted average of 0.42 ps 10 from ³⁸ Ar(α,nγ), 0.28 ps 9 from ⁴¹ K(p,nγ), and 0.47 ps 5 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ), all from DSAM.
2009.73 21	3/2+&	BCD FGHIJ MNo	0.505 ns 12	T _{1/2} : weighted average of 0.46 ns 5 from (HI,xnγ), 0.56 ns 14 from ⁴¹ K(p,nγ), and 0.506 ns 12 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ). Other: >3.1 ps from ³⁸ Ar(α,nγ).
2462.38 17	3/2-a	CD FGHI M o	3.4 ps 10	T _{1/2} : weighted average of 2.4 ps 6 from ³⁸ Ar(α,nγ) and 4.4 ps 6 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ). Other: >0.5 ps from ⁴¹ K(p,nγ).
2576.0 6	5/2-@	A C FGHI LM o	0.16 ps 4	Jπ: L(³ He,d)=1+3 for a 2587 group from 4- target implying π=+ is discrepant. T _{1/2} : weighted average of 0.107 ps 28 from ³⁸ Ar(α,nγ) and 0.180 ps 20 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ). Other: 66 ps 21 from ⁴¹ K(p,nγ).

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Adopted Levels, Gammas (continued) ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF			$T_{1/2}$	Comments
2605.5 3	5/2+ ^b	C	GHI	MNO	0.35 ps 6	$J\pi$: From L(p,t)=1+3 from 7/2- target. L($^3\text{He},\alpha$)=3 for a 2610 group implying $\pi=-$ is discrepant. $T_{1/2}$: weighted average of 0.27 ps 7 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 0.39 ps 5 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$. Other: 0.111 ps 35 from $^{41}\text{K}(p,n\gamma)$.
2670.24 25	1/2+	CD	FGH	MNO	2.2 ps 5	E(level): 2680 in ($^3\text{He},\alpha$). $J\pi$: L(d,p)=0. $T_{1/2}$: weighted average of 1.7 ps 5 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 2.8 ps 6 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$. Other: 0.28 ps +29-18 from $^{41}\text{K}(p,n\gamma)$.
2884.5 6	7/2+ ^b	C	HI	LMNO	21 fs 17	$T_{1/2}$: from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$. Others: < 14 fs from $^{38}\text{Ar}(\alpha,n\gamma), \leq 14$ fs from $^{41}\text{K}(p,n\gamma)$.
2959.3 6	7/2- ^b	A C	GHI	M O	28 fs 7	$T_{1/2}$: weighted average of 24 fs 7 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 41 fs 13 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$. Other: <28 fs from $^{41}\text{K}(p,n\gamma)$.
3049.86 23	3/2+ ^b	CD	FGH	NO	0.7 ps 3	E(level): 3080 in (p,d). $T_{1/2}$: weighted average of 0.49 ps 14 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 1.12 ps +19-15 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
3131? 5			H	O		
3201.39 ^c 16	9/2+ ^{#c}	BCDE	HI	M O	31 fs 10	$J\pi$: (5/2-, 7/2-) from L($^3\text{He},\alpha$)=(3) for a 3210 group is in disagreement. $T_{1/2}$: weighted average of 35 fs 14 from $^{38}\text{Ar}(\alpha,n\gamma)$, 40 fs 20 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$ and 19 fs 17 from $^{41}\text{K}(p,n\gamma)$.
3369.61 13	11/2+ ^b	BCDE	H J L	O	20.6 ps 8	$T_{1/2}$: from (HI,xn γ). Others: >3.1 ps $^{38}\text{Ar}(\alpha,n\gamma)$, < 2.8 ns $^{39}\text{K}(^7\text{Li},\alpha n\gamma), ^{40}\text{Ca}(^3\text{He},2p\gamma)$.
3399.9 3	1/2+	C	FGHI	NO	82 fs 21	XREF: H(3408). E(level): 3450 in (d,t). $J\pi$: L(d,p)=0. $T_{1/2}$: from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$. Other: <69 fs from $^{38}\text{Ar}(\alpha,n\gamma)$.
3494.8 4	5/2+ ^{&}	C	G	L o	0.28 ps 6	E(level): 3510 in (p,d). $T_{1/2}$: weighted average of 0.24 ps 8 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 0.30 ps 6 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
3526.6 ^c 6	3/2+ ^{b c}	C	F H	No	38 fs 17	$J\pi$: 5/2-, 7/2- from L($^3\text{He},\alpha$)=3 for a 3527 12 group is in disagreement. $T_{1/2}$: weighted average of 69 fs 42 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 33 fs 17 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
3613.63 22	1/2- ^a	C	Fg	LM o	0.11 ps 5	$T_{1/2}$: from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
3614.4 8	7/2+ ^b	C	g	M o	15 fs 9	$T_{1/2}$: from $^{41}\text{K}(p,n\gamma)$. Other: <17 fs from $^{38}\text{Ar}(\alpha,n\gamma)$.
3677.0 6	9/2- ^b	C	H	O	45 fs 12	XREF: H(3686). E(level): 3686 in (pol d,p),(d,p). $T_{1/2}$: weighted average of 44 fs 12 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 53 fs 28 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
3730.8 3	3/2- ^a	C	G	M O	45 fs 14	$T_{1/2}$: weighted average of 52 fs 14 from $^{38}\text{Ar}(\alpha,n\gamma)$ and 38 fs 14 from $^{41}\text{K}(p,n\gamma)$. Other: 0.26 ps 5 from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
3736.7 15		F				

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Adopted Levels, Gammas (continued)

 ^{41}Ca Levels (continued)

E(level) [†]	Jπ [‡]	XREF	T _{1/2}	Comments
3740.3 4	(3/2, 5/2) ⁺ ^b	C F HI L NO	<35 fs ^d	XREF: N(3754). Jπ: π=+ is also supported by L(³ He,d)=1 from 4- target and L(³ He,p)=0+2 from 3/2+ target. 5/2+ was proposed in an earlier (pol d,p) study (1972Ko41), but this level was not reported in recent (pol d,p) work (1994Uo01,1990Ec01).
3829.87 17	15/2 ⁺ ^b	BCDE G JKL O	3.02 ns 13	μ=+2.18 15 (1975Yo05). T _{1/2} : weighted average of 3.00 ns 10 from (HI,xnγ) and 3.8 ns 6 from ³⁹ K(⁷ Li,αnγ), ⁴⁰ Ca(³ He,2pγ). Other: >3.12 ps from ³⁸ Ar(α,nγ).
3845.9 7	1/2 ⁺	FGH K NO	111 fs ^e 31	E(level): 3862 in (³ He,α). Jπ: L(d,p)=L(d,t)=0.
3914.79 21	13/2 ⁺ ^b	BCDE G JKL O	1.5 ps 3	T _{1/2} : weighted average of 1.9 ps 4 from (HI,xnγ) and 1.21 ps 31 from ³⁸ Ar(α,nγ). Jπ: L(d,t)=0.
3920	1/2 ⁺		O	
3944.5 3	1/2 ⁻ ^a	FGH O	<20 fs ^e	
3974.3 5	7/2 ⁺ ^b	C jkl o	24 fs ^d 10	T _{1/2} : other: 88 fs 35 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ).
3976.02 22	11/2 ⁺ ^b	C jkl No	23 fs ^d 7	XREF: N(3992).
4015.1 ^c 8	11/2 ⁻ ^{b c}	C NO	10 fs ^d 4	XREF: N(3992). Jπ: (5/2-, 7/2-) from L(³ He,α)=(3) for a 4018 15 group is in disagreement.
4096.8 ^c 6	5/2 ⁺ ^c	C HI KL NO	<21 fs ^e	E(level): 4120 in (p,d). Jπ: L(d,p)=2; γ to 7/2-; RUL. π=- from L(³ He,α)=3 for a 4108 15 group is in disagreement.
4184.2 ^c 6	(3/2, 5/2) ^c	G I NO	39 fs ^e 12	T _{1/2} : other: < 28 fs from ³⁸ Ar(α,nγ). E(level): 4198 in (pol d,p),(d,p); 4150 in (d,t). Jπ: γ's to 3/2+ and 5/2+; π=+ from L(d,t)=2 for a 4150 group, but π=- from L(d,p)=1 for a tentative group at 4198.
4277.3 ^c 10	(5/2, 7/2, 9/2) ⁻ ^c	C O	<26 fs ^e	Jπ: (3/2 to 11/2)- from L(p,t)=L(p,p')=2 from 7/2- target; 5/2, 7/2, 9/2 from γ(θ) in (α,nγ); (9/2)+ from L(d,p)=4 and (pol d,p), is in disagreement.
4328.4 11			NO	T _{1/2} : other: < 49 fs from ³⁸ Ar(α,nγ).
4343.1 ^c 10	9/2 ⁻ ^{b c}	C H O	<110 fs ^e 0.13 ps 3	E(level): 4367 in (pol d,p),(d,p). Jπ: π=(+) from L(α,α')=(3) from 7/2- target for a 4343 5 group is in disagreement.
4416.5 7	3/2 ⁺ ^{&}	C h NO	40 fs 10	T _{1/2} : weighted average of 125 fs 35 from ³⁸ Ar(α,nγ) and 132 fs 35 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ).
4451.0 10	9/2 ⁺ ^{#b}	C h KL O	83 fs ^d 31	T _{1/2} : weighted average of 28 fs 24 from ³⁸ Ar(α,nγ) and 42 fs 10 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ).
4519.64 22	13/2 ⁺ ^b	C JK O	<49 fs ^d	T _{1/2} : other: <101 fs from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ).
4550.1 10		C no	93 fs 21	T _{1/2} : weighted average of 97 fs 28 from ³⁸ Ar(α,nγ) and 87 fs 31 from ⁴⁰ Ca(d,pγ), ² H(⁴⁰ Ca,pγ).
4569 5			no	
4603.3 20	3/2 ⁻ ^a	FG O	<37 fs ^e	E(level): 4618 in (³ He,α).
4648 15			O	
4728.1 7	(3/2) ⁺	I no	<30 fs ^e	Jπ: see comment for 4730 level.

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Adopted Levels, Gammas (continued) ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF				$T_{1/2}$	Comments
4731.2 ^c 6	(5/2) ⁺ ^c	C	HI	KL	no	21 fs ^d 10	$J\pi$: L($^3\text{He},p$)=0+2 from 3/2+ target; L($^3\text{He},d$)=L(d,n)=1+3 from 4- target; L(α,α')=3 from 7/2- target; L(p,t)=3 for a doublet from 7/2- target. Based on all the L-transfers both levels of the doublet at 4728 and 4730 are of positive parity; with most likely spin of 5/2 for 4730 and 3/2 for 4728. But (9/2)+ from L(d,p)=4 and (pol d,p) is in disagreement.
4752.8 3	1/2- ^a	FG		O		30 fs ^e 10	
4778.6 21	(3/2) ⁺ &	F	I	O		<15 fs ^e	
4797 5				O			
4814.9 8	5/2+&		I	no		<37 fs ^e	
4830.7 9	(3/2) ⁺ &		H	no			
4882.9 11	5/2- [@]	C	I	O		<87 fs ^d	$T_{1/2}$: other: < 34 fs in $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
4928 5				O			E(level): From (p,p'), 4944 in (pol d,p),(d,p).
4966 5				N			
4972.6 8	9/2+ [#]	C	I j	KL	no	49 fs ^d 45	XREF: I(4961). $T_{1/2}$: other: <25 fs from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$.
4995.1 18			j	no			
5010.3 20	1/2+	FGH		O			XREF: O(?). $J\pi$: L(d,p)=0. E(level): 5050 in (α,α'). $J\pi$: L(d,n)=1 from 4- target; γ to 7/2-.
5046.9 10	(9/2) ⁺ [#]		H	l	o		XREF: F(?)O(?).
5057.1 14	(5/2, 7/2, 9/2) ⁺	C		Kl	o	0.14 ps ^d 7	
5072.3 9	1/2- ^a		F		o		
5078.4 25	1/2- ^a		G		nO		
5095.3 10	3/2+&				nO		
5120.1 9	3/2- ^a	C			o	0.8 ps ^d 7	E(level): 5110 in (α,α'). $T_{1/2}$: <46 fs from $^{40}\text{Ca}(d,p\gamma), ^2\text{H}(^{40}\text{Ca},p\gamma)$. XREF: O(5129). E(level): 5129 in ($^3\text{He},\alpha$).
5148.1 16	7/2- [@]				o		$J\pi$: γ to 7/2-.
5154.4 16		C			o	<125 fs ^d	XREF: I(?).
5194.9 8	9/2+ [#]		HI j	KL	no		$T_{1/2}$: other: <0.35 ps from (HI,xn γ). XREF: N(?).
5219.0 3	(13/2, 17/2) ⁺ ^b	BCDE	G	jK	nO	<28 fs ^d	E(level): From (d,p γ), $^2\text{H}(^{40}\text{Ca},p\gamma)$, 5300 in ($^3\text{He},\alpha$).
5283.2 11	5/2+&		hI	L	No	<37 fs ^e	$J\pi$: also L($^3\text{He},\alpha$)=2.
5290.3 13		C	h		no	<104 fs ^d	
5305 4			h		no		
5339.7 16	(7/2, 9/2, 11/2) ⁺			JKLM	o		XREF: K(5336). $J\pi$: L(α,d)=6 from 3/2+ target; L($^3\text{He},d$)=1 from 4- target.
5349.7 13	7/2-			K	o		XREF: K(5336). $J\pi$: L(p,t)=0 from 7/2- target.
5369.0 15	3/2- ^a		F		O		
5411.4 ^c 8	5/2+& ^c		HI	KL	NO	<30 fs ^e	$J\pi$: $\pi=(-)$ from L($^3\text{He},\alpha$)=(3) for a 5425 15 group is in disagreement.
5451.7 11	1/2- ^a		F		O		XREF: F(?).
5468.4 9	3/2- ^a		F	I	O		XREF: O(?).
5482.2 13	(3/2) ⁺ &		H		no		XREF: O(?).
5506.5 16		C			no	62 fs ^d 21	
5519.9 13	(5/2)- [@]				o		
5539 3	(5/2 to 11/2) ⁺ [§]			JKL	O		
5588 2	(9/2) ⁺ [#]				O		
5616 4	(5/2)- [@]				O		
5635 5	+				NO		$J\pi$: L($^3\text{He},t$)=2 at 5631 level from 3/2+ target.
5648.8 13	(5/2)- [@]				NO		XREF: O(?).
5669.4 15	3/2- ^a	F			O		

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Adopted Levels, Gammas (continued)
⁴¹Ca Levels (continued)

E(level) [†]	Jπ [‡]	XREF	T _{1/2}	Comments
5685 ^c 3	(5/2, 7/2) - ^c		O	Jπ: L(α, ³ He)=3. π=(+) from L(p,p')=(3,5) from 7/2- target for a 5682 5 group is in disagreement.
5704.0 9	1/2 - ^a		O	
5719.0 6	(5/2) - [@]	I L NO		XREF: I(5716).
5728.3 18	5/2 + ^{&}	H K NO		XREF: K(5714).
5750.9 15	9/2 + [#]	h K1 o		XREF: K(5759)O(?).
5759.6 11	(5/2) + ^{&}	h K1 o		E(level): 5740 in (α, ³ He).
5801.2 15	(5/2) - [@]		O	XREF: K(5759).
5817.1 5	3/2 +	HI L NO	<28 fs	Jπ: also L(α, ³ He)=3. T=3/2.
				E(level): L=2 5852 group in (p,d) and (³ He,α) is associated with 5819, T=3/2 analog state, based on large (L=2) C ² s factors.
				Jπ: γ(θ) in (³ He,αγ).
				T _{1/2} : from ⁴² Ca(³ He,αγ).
5849 5			O	
5866 3			O	
5891.6 14	1/2 - ^a		NO	
5910 3			O	
5933.2 ^c 10	(5/2) - ^{@c}		O	Jπ: π=(+) from L(p,p')=(3,5) from 7/2- target for a 5927 5 group is in disagreement.
5975.9 12	(3/2, 5/2) +	h I KL No		XREF: I(?)N(5963).
				Jπ: L(d,p)=2. (pol d,p) favors 3/2+, but L(d,n)=1+3 from 4- target does not permit 3/2.
5984 5	1/2 +	h o		Jπ: L(³ He,α)=L(p,d)=0.
				E(level): 6000 in (p,d); 5997 in (³ He,α).
6004.6 13	1/2 - ^a		o	
6013 3			No	
6036.0 17	(9/2) + [#]	kL o		
6066 ^c 2	(5/2 to 11/2) + ^{§c}	JkL No		Jπ: (5/2-, 7/2-) from L(α, ³ He)=(3) for a 6067 group is in disagreement.
				E(level): 6057 in (p,p').
6083 2	(3/2) + ^{&}	H k o		E(level): 6071 in (p,p').
6098.7 14	5/2 +	H L o		Jπ: L(d,n)=1 from 4- target; L(³ He,α)=2.
				E(level): 6117 in (³ He,α).
6140.6 16	(5/2, 7/2) -		o	Jπ: L(d,p)=3.
6148 3			o	
6164 2			O	
6179.8 13	1/2 - ^a		O	
6192.9 11			o	E(level): 6197 in (p,p').
6208.2 13	3/2 - ^a		o	
6238.8 8	5/2 - [@]		O	E(level): 6232 in (p,p').
6245 5			O	
6272.9 12	5/2 - [@]		O	
6284.0 17	(5/2) + ^{&}		O	
6295.9 21	7/2 - [@]	L O		
6325.1 11	(5/2) +	HI KL NO		Jπ: L(d,n)=1 from 4- target; γ to 3/2-.
6354.1 24	5/2 + ^{&}	h O		
6376.7 10	1/2 - ^a		O	
6400.7 13	(9/2) + [#]	H 1 o		E(level): 6410 in (α,α').
6410.9 4	(1/2, 3/2, 5/2) +	1 o		Jπ: L(d,p)<3.
6437.9 7	5/2 - [@]		O	
6450.7 14	5/2 - [@]		O	
6462 10	(5/2 to 11/2) +	L No		Jπ: L(³ He,d)=1+3 from 4- target.
6483.4 22	+	H J o		Jπ: L(α,d)=4+6 from 3/2+ target.
				E(level): 6500 in (α,α').
6520.6 11	5/2 - [@]		o	
6527 7	(5/2 to 11/2) + [§]	KL o		
6553 10		No		XREF: O(?).
6567.4 13	7/2 - [@]		o	
6602.6 15	(≥5/2)		O	Jπ: L(d,p)>2.

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Adopted Levels, Gammas (continued) ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}$	Comments
6614.2 16	($\geq 5/2$)	O		$J\pi$: L(d,p)>2.
6628.6 24		O		
6647.0 20	5/2-@	NO		
6674.3 13	5/2+&	O		
6686.2 8	7/2-@	O		
6729.2 10	7/2-@	O		
6738 7	(5/2 to 11/2)+ [§]	KL n		
6748.1 9	7/2-@	nO		
6792.9 19	(5/2)+&	O		
6806.7 15	(3/2)+&	O		
6822.4 5	1/2+	NO	<28 fs	T=3/2. E(level): 6851 15 in (p,d) and ($^3\text{He},\alpha$) differs significantly, but most likely these correspond to the 6822 level seen in ($^3\text{He},\alpha\gamma$). $J\pi$: L($^3\text{He},\alpha$)=L(p,d)=0. $T_{1/2}$: from $^{42}\text{Ca}(\alpha,^3\text{He},\alpha\gamma)$. $J\pi$: $\Delta J=1$ γ to (13/2,17/2)+. $T_{1/2}$: from (HI,XN γ).
6826.3 5	(15/2, 19/2)	B E	<1.7 ps	
6851.8 15	5/2+&	O		
6869.5 10	(5/2)-@	O		
6901.2 ^c 24	5/2+& ^c	no		$J\pi$: (5/2-, 7/2-) from L($\alpha,^3\text{He}$)=(3) for a 6900 group is in disagreement.
6917.3 25	(9/2)+ [#]	no		
6931.8 19		O		E(level): probable doublet.
6966 ^c 15	3/2+, 5/2+ ^c	NO		$J\pi$: L($^3\text{He},\alpha$)=2. (7/2+, 9/2+) from L($\alpha,^3\text{He}$)=(4) for a 6980 group is in disagreement. E(level): 6980 in ($\alpha,^3\text{He}$). E(level): 6984 5 ($^3\text{He},t$).
6990.6 10	5/2-@	NO		
7014.8 7	(9/2)+ [#]	KL o		
7026.5 15		o		
7041.0 5	3/2-a	o		
7073.1 25	1/2-a	O		
7092.7 18	(9/2)+ [#]	l O		
7107.8 25	(5/2 to 11/2)-	kl no		$J\pi$: L($^3\text{He},t$)=3+5 at 7120 level from 3/2+ target.
7115.8 23		kl no		
7137.5 27	5/2+&	O		
7145.6 8	7/2-	O		T=3/2. $J\pi$: L(p,t)=0 from 7/2- target.
7164.2 21	(9/2)+ [#]	O		
7176.1 10	(5/2, 7/2)-	O		$J\pi$: L(p,d)=L($^3\text{He},\alpha$)=3.
7191 3	1/2-a	NO		
7225 5		N		
7237.8 23	5/2-@	O		
7268 3	(5/2)+	K O		$J\pi$: L(d,n)=1 from 4- target; L(d,p)<4.
7295.8 10	5/2-@	NO		
7308.4 9	7/2-@	O		
7332 5		N		
7340.6 24	3/2+&	O		
7365.3 14	(5/2)-@	O		
7367 15	1/2+	NO		$J\pi$: L($^3\text{He},\alpha$)=0.
7377.1 9	(5/2)-@	O		
7392.9 19	(5/2 to 11/2)+ [§]	KL O		
7417.1 15	(7/2, 9/2)-	K O		$J\pi$: L(d,n)=0 from 4- target.
7437.3 11	5/2-@	O		
7440 20	1/2+ and (3/2, 5/2)+	O		$J\pi$: L(p,d)=0+2.
7459 3	5/2-@	O		
7487.5 6	+	NO		$J\pi$: L($^3\text{He},t$)=2 at 7499 level from 3/2+ target.
7508.8 17	7/2-@	O		
7524.7 14	7/2-@	o		
7533 10	(5/2 to 11/2)+ [§]	K o		
7537.9 14	(5/2)-@	o		

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Adopted Levels, Gammas (continued)

 ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	Comments
7553 8		No	
7576.4 21	+	K O	J π : L(d,n)=3 from 4- target. E(level): 7587 in ($^3\text{He},\alpha$).
7587 15	(5/2, 7/2)-	NO	J π : L($^3\text{He},\alpha$)=3.
7607.6 22	(9/2)+ [#]	NO	
7614 8		N	
7631.3 16	(9/2)+ [#]	O	
7639 5		N	
7657.0 13	(1/2, 3/2, 5/2+)	O	J π : L(d,p)<3; L($^3\text{He},\alpha$)=(0) favors 1/2+. E(level): 7639 in ($^3\text{He},\alpha$).
7678.6 20		O	
7706.7 10	($\geq 5/2$)	O	J π : L(d,p)>2.
7720 20		N	
7731.7 12	($\geq 5/2$)	O	J π : L(d,p)>2.
7751.0 9	1/2+	O	J π : L($^3\text{He},\alpha$)=0.
7770.3 14	1/2+	K O	J π : L(p,d)=0.
7792 5		N	
7817.1 11	5/2-@	O	
7854 5		N	
7887.8 11	5/2-@	O	
7901 5		N	
7919.1 24	(5/2)-@	O	
7957 3	5/2-@	O	
7974 3	7/2-@	O	
7990 20	1/2+ and 3/2+, 5/2+	NO	J π : L(p,d)=0+2.
7995 3	(9/2)+ [#]	KL O	
8040 10	(5/2 to 11/2)+ [§]	KL n	
8047.5 17	(5/2)-@	nO	
8063.4 23	7/2-@	O	
8101.8 14	7/2-@	O	
8120 3	5/2+&	O	
8136.1 16	(5/2)-@	NO	
8150.8 9	(5/2)-@	O	
8179.0 19	5/2+&	K o	E(level): 8172 in ($^3\text{He},\alpha$).
8199.7 19	7/2-@	o	
8229.4 19	5/2+&	O	E(level): 8212 in ($^3\text{He},\alpha$).
8242 3	(1/2, 3/2, 5/2+)	O	J π : L(d,p)<3.
8259 3		O	
8272 7		N	
8311 15	(3/2, 5/2)+	k O	J π : L(p,d)=L($^3\text{He},\alpha$)=2.
8312.7 21	(9/2)+ [#]	k O	
8335.7 23	(5/2)-@	O	
8347 7		N	
8373.5 18	5/2+&	k1 O	J π : see comment for 8402 level also.
8402.2 21	(5/2 to 11/2)+	k1 NO	J π : J π =(5/2:11/2)+ from L(d,n)=L($^3\text{He},d$)=1+3 from 4- target for 8388 10 group.
8447.4 ^c 38	(9/2)+ ^{#c}	KL O	J π : (1/2-, 3/2-) from L($^3\text{He},\alpha$)=(1) for a 8444 group is in disagreement.
8467.4 12	7/2-@	NO	
8504 10	(5/2 to 11/2)+ [§]	KL N	
8522.4 20	7/2-@	O	
8549 3	5/2-@	O	
8551 15	1/2+	O	J π : L($^3\text{He},\alpha$)=0. E(level): average of 8560 in (p,d) and 8543 in ($^3\text{He},\alpha$).
8585 3	7/2-@	K NO	
8620 4	5/2-@	O	
8630 10	(5/2 to 11/2)+ [§]	KL o	
8638 4	5/2-@	o	
8656 10	(5/2 to 11/2)+ [§]	K NO	
8674 3		o	
8700 4	5/2+&	K NO	
8741 15		O	
8783 10	5/2-@	O	

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Adopted Levels, Gammas (continued) ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	Comments
8855 10	(9/2+) #	NO	
8916 10	(3/2-, 9/2+)	NO	$J\pi$: L(d,p)=(1,4) and (pol d,p).
8980 10	(5/2+) +	K O	$J\pi$: L(d,n)=1 from 4- target; L(p,d)=(2).
8997 10	(9/2+) #	NO	
9047 15	(3/2, 5/2) +	O	$J\pi$: L($^3\text{He},\alpha$)=2.
9084 ^c 10	5/2-@ ^c	NO	$J\pi$: (3/2+, 5/2+) from L(p,d)=(2) is in disagreement. E(level): 9110 in (p,d).
9140 15		O	
9177 10	(5/2 to 11/2) + §	K NO	
9216 15		NO	
9273 10	(5/2 to 11/2) + §	K O	$J\pi$: (5/2-, 9/2+) from L(d,p) and (pol d,p).
9315 10		NO	
9375 10	5/2+	K O	$J\pi$: L(d,n)=1 from 4- target; L($^3\text{He},\alpha$)=2.
9420 10	(5/2 to 11/2) + §	K NO	
9475 10		O	
9555 15	(5/2 to 11/2) + §	K O	
9590 7		N	
9616 7		N	
9650 20	(5/2 to 11/2) + §	K N	
9720 20	(5/2 to 11/2) + §	K	
9880 20	(5/2 to 11/2) + §	K N	
9910 20	(5/2 to 11/2) + §	K	
9920 20	(5/2 to 11/2) + §	K	
10030 20		N	
10113 7		N	
10177 15		NO	
10194 7		N	
10238 7		N	
10300 20	(5/2 to 11/2) + §	K N	
10339 7		N	
10421 7		N	
10752 15		O	
10859 15	(3/2, 5/2) +	O	$J\pi$: L($^3\text{He},\alpha$)=2.
10950 20	(3/2, 5/2) +	O	$J\pi$: L(p,d)=2.
11817 15		O	

[†] From least-squares fit to E γ 's, when explicit E γ 's are available in literature. In other cases levels are taken from ($^3\text{He},\alpha$), (d,n), ($^3\text{He},t$), (pol d,p), (d,p), or (p,d).

[‡] When L-transfer arguments are used, target $J\pi=0+$ if not specified otherwise.

§ L(d,n)=1 from 4- (^{40}K) target.

L(d,p)=4 and (pol d,p).

@ L(d,p)=3 and (pol d,p).

& L(d,p)=2 and (pol d,p).

^a L(d,p)=1 and (pol d,p).

^b $\gamma(0)$ and $\gamma(\text{lin pol})$ in ($\alpha, n\gamma$).

^c Assigned $J\pi$ is in disagreement with L-transfer in one of the reactions as mentioned under comments. It is possible that there are two levels near this energy.

^d From DSAM in $^{38}\text{Ar}(\alpha, n\gamma)$.

^e From DSAM in $^{40}\text{Ca}(d, p\gamma), ^2\text{H}(^{40}\text{Ca}, p\gamma)$.

 $\gamma(^{41}\text{Ca})$

E(level)	E $\gamma^{\ddagger}$	I γ^a	Mult. @	$\delta^{\&c}$	α	Comments
1942.88	1942.70 20	100	E2		3.08×10^{-4}	B(E2)(W.u.)=5.8 7.
2009.73	2009.8 3	100	M2+E3	+0.16 2	1.70×10^{-4}	I $\gamma < 5$ for γ to 1943 level ((p,n γ), 1970Ho26). δ : Other: +0.095 22 in ($^3\text{He}, \alpha\gamma$). B(M2)(W.u.)=0.154 4; B(E3)(W.u.)=4.5 12.
2462.38	519.57 15	100	M1+E2	+0.03 12	2.59×10^{-4} 8	I $\gamma < 0.5$ for γ to 2010 level and <0.3 to g.s. (see (p,n γ)). B(M1)(W.u.)=0.046 14; B(E2)(W.u.)=0.5 4.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{41}\text{Ca})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	I_{γ}^a	Mult. @	$\delta \&^c$	α	Comments
2576.0	2576.3 6	100	M1+E2		0.00056 5	δ : -0.36 8 or -1.48 11 in ($\alpha, n\gamma$). $I_{\gamma}<1$ for γ 's to 1943 and 2010 levels (see (p,n γ)).
2605.5	2605.7 $\frac{1}{2}$ 6	100	E1+M2	-0.03 1	1.03×10^{-3}	$I_{\gamma}<5$ for γ to 1943 and <8 to 2010 level (see (p,n γ)). B(E1)(W.u.)= 9.2×10^{-5} 16; B(M2)(W.u.)=0.06 4. B(M1)(W.u.)=0.012 3.
2670.24	660.4 2 727.6 5	52 2 100 2	M1 E1 (+M2)		1.56×10^{-4}	$I_{\gamma}<6$ for γ to g.s. (see (p,n γ)). δ : <0.03 from RUL for M2.
2884.5	2883.8 $\frac{1}{2}$ 6	100	E1+M2	-0.08 6	1.19×10^{-3} 2	$I_{\gamma}<1$ for γ 's to 1943 and 2010 levels (see (p,n γ)). B(E1)(W.u.)=0.0011 9; B(M2)(W.u.)=4 +7-4. B(M1)(W.u.)=0.028 7; B(E2)(W.u.)=0.82 22.
2959.3	2959.2 $\frac{1}{2}$ 7	100	M1+E2	-0.29 1	6.71×10^{-4}	δ : Other: -0.31 3 in ($^3\text{He}, \alpha\gamma$). E γ : From (d,p γ).
3049.86	379.3# 444.4 $\frac{1}{2}$ 2 1040.6 3 1106.4 $\frac{1}{2}$ 3	7 ^b 2 73 ^b 5 100 ^b 5 63 ^b 5	M1 E1			B(M1)(W.u.)=0.011 5. $I_{\gamma}<8$ for γ to g.s. (see (d,p γ)). B(E1)(W.u.)=0.00016 7.
3201.39	3201.1 2	100	E1+M2	-0.02 1	1.35×10^{-3}	$I_{\gamma}<5$ for γ to 2606 (see (d,p γ)). B(E1)(W.u.)=0.00056 18; B(M2)(W.u.) $\leq$ 0.21. δ : Other: +0.09 7 in ($^3\text{He}, \alpha\gamma$). B(M1)(W.u.)=0.129 6; B(E2)(W.u.) $\leq$ 18. B(M2)(W.u.)=0.066 8; B(E3)(W.u.)=24 3.
3369.61	168.04 24 3369.54 14	100 2 74 2	M1 (+E2) M2+E3	-0.02 2 +0.94 +10-5	0.00358 7 6.39×10^{-4} 10	B(M1)(W.u.)=0.129 6; B(E2)(W.u.) $\leq$ 18. B(M2)(W.u.)=0.066 8; B(E3)(W.u.)=24 3.
3399.9	1390.11 20	100	M1+E2			
3494.8	444.8 $\frac{1}{2}$ 4 1485.2 $\frac{1}{2}$ 4 3494	15 ^b 4 100 ^b 4 6 ^b 2	M1+E2 [E1]	-0.14 4	1.48×10^{-3}	B(M1)(W.u.)=0.019 5; B(E2)(W.u.)=0.5 4. E γ : From (d,p γ). B(E1)(W.u.)= 2.4×10^{-6} 10.
3526.6	856	18 ^b 4	M1+E2	+0.22 7		E γ : From (d,p γ). δ : or -3.1 +6-9 from ($^3\text{He}, \alpha$). B(M1)(W.u.)=0.09 5; B(E2)(W.u.)=18 14. E γ : From (d,p γ).
3613.63	1516 1584.5 $\frac{1}{2}$ 8 943.0 $\frac{1}{2}$ 10 1151.24 $\frac{1}{2}$ 20 1670.71 $\frac{1}{2}$ 20	64 ^b 6 100 ^b 5 31 4 65 8 100 8	[E1+M2] [E1]		3.46×10^{-4} 6	B(E1)(W.u.)=0.0010 5.
3614.4	3614.2 $\frac{1}{2}$ 8	100	E1+M2	+0.06 5	1.53×10^{-3} 2	E γ : 3612.8 in (d,p γ). B(E1)(W.u.)=0.0008 5; B(M2)(W.u.) $\leq$ 2.8. B(M1)(W.u.)=0.072 21; B(E2)(W.u.)=15 9.
3677.0	717.7 $\frac{1}{2}$ 4 3676.8 $\frac{1}{2}$ 8	6.0 6 100.0 6	M1+E2 M1+E2	-0.19 +5-9 -1.28 2	1.34×10^{-4} 4 1.01×10^{-3}	B(M1)(W.u.)=0.0035 10; B(E2)(W.u.)=1.3 4. E γ : From (d,p γ).
3730.8	1156 1268.4 $\frac{1}{2}$ 3 1787.6 $\frac{1}{2}$ 5 3730.4 $\frac{1}{2}$ 8	69 ^b 20 100 ^b 17 49 12 69 ^b 12	M1+E2 M1+E2 (E2)		0.00021 3 1.08×10^{-3}	B(E2)(W.u.)=0.50 19.
3736.7	3736.5 $\frac{1}{2}$ 15	100				
3740.3	1135 1730.5 $\frac{1}{2}$ 4	52 ^b 5 100 ^b 5	M1 (+E2)	<0.4	1.70×10^{-4} 4	E γ : From (d,p γ). δ : -0.3 1 for J(3740)=5/2; 0.0 2 for J(3740)=3/2. B(M1)(W.u.)>0.069. B(E2)(W.u.)=1.08 5.
3829.87	460.25 11	100	E2		8.77×10^{-4}	E γ : from (n, γ) E=th seen only by 1967Gr14. Evaluators consider this gamma questionable as it was not confirmed in any other studies.
3845.9	444.5 ^d 4					E γ : From (d,p γ). E γ : From (d,p γ).
3914.79	1836 1903 545.31 18	100 ^b 6 25 ^b 6 100	M1 (+E2)	-0.01 3	2.33×10^{-4}	B(M1)(W.u.)=0.091 19; B(E2)(W.u.) $\leq$ 0.65.
3944.5	1482.0 $\frac{1}{2}$ 3 2001.6 $\frac{1}{2}$ 4	7.5 21 100.0 21				
3974.3	1368.5 $\frac{1}{2}$ 4 3975.1 $\frac{1}{2}$ 8	100 2 75 2	M1+E2 [E1]	+0.06 3	1.68×10^{-3}	B(M1)(W.u.)=0.20 9; B(E2)(W.u.) $\leq$ 2.5. B(E1)(W.u.)=0.00016 7.
3976.02	606.5 $\frac{1}{2}$ 5	22 10				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{41}\text{Ca})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	I_{γ}^a	Mult. @	$\delta \&^c$	α	Comments
3976.02	774.6 $\frac{1}{2}$ 2	100 10	M1+E2	-0.09 2	1.13 $\times 10^{-4}$	B(M1)(W.u.)=1.7 6; B(E2)(W.u.)=70 40.
4015.1	4014.9 $\frac{1}{2}$ 8	100	E2		1.18 $\times 10^{-3}$	B(E2)(W.u.)=6 3.
4096.8	2086.6 $\frac{1}{2}$ 8	100 9	M1 (+E2)	+0.06 5	3.04 $\times 10^{-4}$	B(M1)(W.u.)>0.073. δ : From ($^3\text{He}, \alpha$). B(E1)(W.u.)>0.00014.
	4097.3 $\frac{1}{2}$ 10	56 9	E1 (+M2)	+0.01 4	1.72 $\times 10^{-3}$ 3	δ : From ($^3\text{He}, \alpha$). E γ : From (d,p γ). E γ : From (d,p γ). γ to 2605 level with $I_{\gamma}=22$ 12 (1971Fo09) in (d,p γ) has not been confirmed in other studies.
4184.2	1579	45 ^b 4				E γ : From (d,p γ). E γ : From (d,p γ).
	2174	100 ^b 4				
4277.3	4277.1 $\frac{1}{2}$ 10	100	D+Q			γ to 2605 level with $I_{\gamma}=22$ 12 (1971Fo09) in (d,p γ) has not been confirmed in other studies.
4328.4	1127	100 ^b				E γ : From (d,p γ).
4343.1	4342.9 $\frac{1}{2}$ 10	100	M1+E2	+7.3 +12-9	1.29 $\times 10^{-3}$	B(M1)(W.u.)=3.8 $\times 10^{-5}$ 15; B(E2)(W.u.)=0.33 8.
4416.5	1812	43 ^b 3				E γ : From (d,p γ).
	2407	100 ^b 3				E γ : From (d,p γ).
4451.0	4450.7 $\frac{1}{2}$ 10	100				
4519.64	543.6 $\frac{1}{2}$ 4	23 6				
	605.5 $\frac{1}{2}$ 4	100 11				
	689.7 $\frac{1}{2}$ 3	82 9				
	1149.7 3	80 9	M1+E2	-0.04 2		B(M1)(W.u.)>0.083; B(E2)(W.u.)>0.00049.
4550.1	4549.8 $\frac{1}{2}$ 10	100				
4603.3	2660.3 $\frac{1}{2}$ 20	100				
4728.1	2718	100				
4731.2	2268	100 ^b 14				E γ : From (d,p γ).
	2790	91 ^b 12				E γ : From (d,p γ).
	4730	42 ^b 9				E γ : From (d,p γ).
4752.8	2290.3 $\frac{1}{2}$ 3	49 3				
	2809.8 $\frac{1}{2}$ 5	100 3				
4778.6	2768.8 $\frac{1}{2}$ 20	100				
4814.9	1931	100 ^b 12				E γ : From (d,p γ).
	4814	69 ^b 12				E γ : From (d,p γ).
4882.9	4882.6 $\frac{1}{2}$ 11	100				
4972.6	2086	90 ^b 45				E γ : From (d,p γ).
	4974.9 $\frac{1}{2}$ 11	100 ^b 45				
5010.3	1611 ^d	82 22				E γ : From (d,p γ).
	3000.2 ^d	100 22				E γ : From (d,p γ).
	3067.3 $\frac{1}{2}$ 20					E γ : from (n, γ) E=th.
5057.1	5056.8 $\frac{1}{2}$ 14	100				
5120.1	2450	100 ^b 17				E γ : From (d,p γ).
	5119.3 $\frac{1}{2}$ 15	69 ^b 17				
5154.4	5154.1 $\frac{1}{2}$ 16	100				
5194.9	2589 ^d					
	3252 ^d					
5219.0	1389.14 25	100	M1 (+E2)	<0.04		B(M1)(W.u.)>0.29.
5283.2	3273.3	100				E γ : From (d,p γ), $^2\text{H}(^{40}\text{Ca}, p\gamma)$.
5290.3	5289.9 $\frac{1}{2}$ 13	100				
5369.0	5368.6 $\frac{1}{2}$ 15	100				
5411.4	2805.7	59				E γ : from ($^3\text{He}, p\gamma$) only.
	3468.5	100				
5468.4	2418.8					
	5467.4 $\frac{1}{2}$ 15					
5506.5	5506.1 16	100				
5669.4	5669.0 $\frac{1}{2}$ 15	100				
5719.0	1534.8	36				
	3709.0	100				
	3776.1	100				
	5718.6	45				
5817.1	1089.0	21 4				
	1720.3	100 8				
	2076.7	15 9				
	2417.1	30 4	D (+Q)			δ : -0.03 14 or -1.7 5 in ($^3\text{He}, \alpha\gamma$).
	3211.5	23 4	D (+Q)			δ : -0.25 +30-65 or -1.8 +9-40 in ($^3\text{He}, \alpha\gamma$).
	3807.2	<6				

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Adopted Levels, Gammas (continued)

$\gamma(^{41}\text{Ca})$ (continued)

E(level)	E $\gamma^{\dagger}$	I γ^a	E(level)	E $\gamma^{\dagger}$	I γ^a	E(level)	E $\gamma^{\dagger}$	I γ^a
5975.9	2576 ^d		6822.4	2094.1	63 5	6822.4	4151.6	100 5
	3370 ^d			2407.2	16 11		4812.1	<5
	3400 ^d			2638.0	18 5	6826.3	1607.2 4	100
	3966 ^d			2976.3	42 5	7145.6	4186	54 11
6325.1	4382			3081.8	24 5		7145	100 11

[†] From weighted averages of available values in (α , $n\gamma$), (n,γ) E=th, ($\alpha,2pn\gamma$), and/or (HI,X $n\gamma$) except as noted.

[‡] From ($\alpha,n\gamma$).

[§] From (n,γ) E=th.

[#] From level energy difference and rounded off to the nearest keV.

[@] From ($\alpha,n\gamma$) and (³He, $\alpha\gamma$). See also (HI,x $n\gamma$) and ($\alpha,2pn\gamma$).

[&] From ($\alpha,n\gamma$) except as noted.

^a Weighted averages of all available data except as noted.

^b From (d,p γ).

^c If no value given it was assumed $\delta=1.00$ for E2/M1, $\delta=1.00$ for E3/M2 and $\delta=0.10$ for the other multipolarities.

^d Placement of transition in the level scheme is uncertain.

⁴¹Sc ϵ Decay (596.3 ms) 1980Wi13,1973Al11

Parent ⁴¹Sc: E=0; J π =7/2-; T_{1/2}=596.3 ms 17; Q(g.s.)=6495.48 16; % ϵ +% β^+ decay=100.

1980Wi13: ⁴¹Sc produced by ⁴⁰Ca(d,n) reaction with E(d)= 6 MeV from ONR-CIT tandem accelerator. Gammas detected with

Ge(Li) detectors. Measured I γ , deduced I(ϵ) and logft values.

1973Al11: ⁴¹Sc produced by ⁴⁰Ca(p, γ) reaction with E(p)=3 MeV from Brookhaven National Laboratory Van de Graaff.

Measured $\beta\gamma$ coin with NE102 plastic scintillator for β rays and NaI(Tl) for γ -rays. Determined T_{1/2} of ⁴¹Sc.

Others:

T_{1/2} measurements:

1973Ta04, 1965Yo02, 1962Cr04, 1960Ja12, 1960Wa04, 1952Ma55, 1941El03.

β spectrum:

1962Cr04, 1941El03.

Moment measurements:

1990Mi16 (also 1990Mi17,1990Mi18,1990Mi19): measured magnetic-dipole moment using β -NMR technique.

1993Mi09 (also 1993Mi37,1993Mi40): measured quadrupole moment using β -NNQR technique.

⁴¹Ca Levels

E(level) [†]	J $\pi^{\dagger}$
0.0	7/2-
2574.9 5	5/2-
2959.4 4	7/2-

[†] From Adopted Levels.

β^+,ϵ Data

E ϵ	E(level)	I $\beta^{+\ddagger}$	I $\epsilon^{\ddagger}$	Log ft	I($\epsilon+\beta^+$) ^{†‡}	Comments
(3536.1 5)	2959.4	0.0138 14	0.000131 13	5.78 5	0.0139 14	I($\epsilon+\beta^+$): Other: < 0.2 (1973Al11).
(3920.6 6)	2574.9	0.023 3	0.00014 2	5.83 6	0.023 3	I($\epsilon+\beta^+$): Other: < 0.2 (1973Al11).
(6495.48 16)	0.0	99.869 3	0.0935 9	3.4529 13	99.963 3	Log ft: 3.736 14 (Gamow-Teller part only,1980Wi13).

[†] From 1980Wi13. Upper limits to other levels are given (1980Wi13) as follows: <0.0034 (to 3676 level), <0.0010 (to 4342 level), <0.0011 (to 4878 level), <0.00079 (to 5355 level), <0.0011 (to 5646 level), <0.0012 (to 5796 level).

[‡] Absolute intensity per 100 decays.

^{41}Sc ϵ Decay (596.3 ms) 1980Wi13,1973Al11 (continued) $\gamma(^{41}\text{Ca})$

$E_{\gamma}^{\ddagger}$	E(level)	$I_{\gamma}^{\dagger\#}$	Mult. §	$\delta^{\S}$	Comments
2574.8	2574.9	0.023 3	M1+E2		δ : -0.36 8 or -1.48 11.
2959.3	2959.4	0.0139 14	M1+E2	-0.29 1	

 † Implied from absolute $\epsilon+\beta^+$ feedings given by 1980Wi13. ‡ From level-energy differences. § From Adopted Gammas. $^{\#}$ Absolute intensity per 100 decays.

Decay Scheme

$^{38}\text{Ar}(\alpha, n\gamma)$ 1980Li10,1977Li07,1976Li17 All references are from the same group with $E(\alpha)=7.5-14$ MeV. Deduced levels, E_{γ} , γ , δ , τ .1980Li10: $E(\alpha)=9.6-13.0$ MeV. Gammas detected with Ge(Li) detector and γ -ray linear polarization measured with threeGe(Li) Compton polarimeter. Measured E_{γ} , I_{γ} , $\gamma(\theta)$, $\gamma(\text{lin pol})$, δ for most of the levels.1977Li09: $\gamma(\theta)$ and $\gamma(\text{lin pol})$ data for $J\pi$ assignments for 3369, 3830, 3914, 3976, 4519 and 5219 levels.1976Li17: $E(\alpha)=7.5-14.5$ MeV. Measured $\gamma\gamma$ coin. and level lifetimes by Doppler-shift attenuation method (DSAM). ^{41}Ca Levels

E(level) $^{\#}$	$J\pi^{\S}$	$T_{1/2}^{\dagger}$	Comments
0.0	$7/2^-$		
1943.0 3	$3/2^-$	0.42 ps 10	
2010.2 3	$3/2^+$	>3.1 ps	
2462.6 4	$3/2^-$	2.4 ps 6	
2576.5 6	$5/2^-$	107 fs 28	
2605.8 4	$5/2^+$	0.27 ps 7	
2670.9 4	$1/2^+$	1.7 ps 5	
2883.9 6	$7/2^+$	<14 fs	
2959.3 6	$7/2^-$	24 fs 7	
3050.2 3	$3/2^+$	0.49 ps 14	
3201.9 5	$9/2^+$	35 fs 14	
3369.6 5	$11/2^+$	>3.1 ps	
3400.2 5	$1/2^+$	<69 fs	
3495.2 4	$5/2^+$	0.24 ps ‡ 8	
3527.5 9	$3/2^+$	69 fs ‡ 42	$J\pi$: 1980Li10 give $5/2^-$.
3614.1 6	$1/2^-$		
3614.4 8	$7/2^+$	<17 fs	
3677.0 6	$9/2^-$	44 fs 12	
3730.9 4	$3/2^-$	52 fs 14	$J\pi$: $3/2^-, 5/2^-$ in 1980Li10.
3740.7 5	$(3/2, 5/2)^+$	<35 fs	

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$^{38}\text{Ar}(\alpha, n\gamma)$ 1980Li10, 1977Li07, 1976Li17 (continued) ^{41}Ca Levels (continued)

E(level)#	$J\pi^{\S}$	$T_{1/2}^{\dagger}$	Comments
3829.9 6	15/2+	>3.12 ps	
3914.2 6	13/2+	1.21 ps 31	
3974.5 5	7/2+	24 fs 10	
3976.4 6	11/2+	0.23 ps ‡ 7	
4015.1 8	11/2-	10 fs 4	
4097.1 7	5/2+	<28 fs	
4277.3 10	(5/2, 7/2, 9/2)-	<49 fs	
4343.1 10	9/2-	125 fs 35	
4415.3 7	3/2+	28 fs 24	
4451.0 10	9/2+	83 fs 31	
4519.6 6	13/2+	<49 fs	
4550.1 10		97 fs 28	
4733.0 11	(5/2)+	21 fs 10	
4882.9 11	5/2-	<87 fs	$J\pi$: 3/2, 5/2 in 1980Li10.
4974.9 11	9/2+	49 fs 45	
5057.1 14		0.14 ps 6	
5119.6 15	3/2-	0.8 ps 7	
5154.4 16		<125 fs	
5219.1 10	(13/2, 17/2)+	<28 fs	
5290.3 13		<104 fs	
5506.5 16		62 fs 21	

 † From DSAM (1976Li17), except where noted. ‡ From DSAM (1980Li10). § From Adopted Levels. Most of these assignments agree with those from 1980Li10 which were based on $\gamma(\theta)$ and $\gamma(\text{lin pol})$ data.# From least-squares fit to $E\gamma$'s. $\gamma(^{41}\text{Ca})$

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\S}$	Mult.#	$\delta^{\#}$	Comments
1943.0	1942.9 5	100	E2		$A_2=-0.04$ 1, $A_4=+0.01$ 1, $\text{pol}=+0.14$ 2.
2010.2	2009.9 5	100	M2+E3	+0.16 2	$A_2=-0.02$ 1, $A_4=+0.01$ 1, $\text{pol}=-0.10$ 2.
2462.6	519.7 2	100	M1+E2	+0.03 1	$A_2=+0.22$ 1, $A_4=+0.02$ 1, $\text{pol}=+0.30$ 2.
2576.5	2576.4 6	100	M1+E2		$A_2=+0.30$ 1, $A_4=+0.00$ 1, $\text{pol}=-0.69$ 7. δ : -0.36 8 or -1.48 11.
2605.8	2605.7 6	100	E1+M2	-0.03 1	$A_2=-0.08$ 1, $A_4=0.00$ 1, $\text{pol}=+0.25$ 4.
2670.9	660.4 2	34.4 14	M1		$A_2=0.00$ 2, $A_4=+0.03$ 3, $\text{pol}=+0.05$ 10.
	728.2 2	65.6 14	E1(+M2)		$A_2=-0.02$ 3, $A_4=+0.06$ 4, $\text{pol}=-0.01$ 5.
2883.9	2883.8 6	100	E1+M2	-0.08 6	$A_2=+0.39$ 1, $A_4=-0.03$ 1, $\text{pol}=-0.98$ 7.
2959.3	2959.2 7	100	M1+E2	-0.29 1	$A_2=+0.17$ 1, $A_4=-0.03$ 1, $\text{pol}=+1.06$ 11.
3050.2	444.4 2	38@ 3			
	1040.6 3	37@ 3	M1		$A_2=+0.01$ 2, $A_4=0.00$ 2, $\text{pol}=+0.11$ 7.
	1106.4 3	21@ 2	E1		$A_2=+0.45$ 3, $A_4=-0.05$ 3, $\text{pol}=-0.71$ 16.
3201.9	3201.4 7	100	E1+M2	-0.02 1	$A_2=-0.32$ 1, $A_4=-0.01$ 1, $\text{pol}=+0.34$ 5.
3369.6	167.7 1	57 1	M1(+E2)	-0.02 2	$A_2=-0.33$ 1, $A_4=0.00$ 1, $\text{pol}=-0.24$ 6.
	3369.8 7	43 1	M2+E3	+0.94 +10-5	$A_2=+0.95$ 1, $A_4=+0.51$ 1, $A_6=+0.16$ 1, $\text{pol}=-0.79$ 11.
3400.2	1390.0 ‡ 3	100	M1+E2		$A_2=0.00$ 3, $A_4=-0.01$ 3, $\text{pol}=+0.02$ 15.
3495.2	444.8 4	12@ 3			
	1485.2 4	83@ 6	M1+E2	-0.14 4	$A_2=-0.10$ 5, $A_4=+0.02$ 6, $\text{pol}=-0.97$ 10.
3527.5	1584.5 8	100	D+Q		Mult.: 1980Li10 give M1+E2, but that is in conflict with adopted $J\pi$. $A_2=-0.34$ 5, $A_4=+0.14$ 6, $\text{pol}=-0.14$ 34.
3614.1	1151.4 4	33& 4			
3614.4	3614.2 8	100	E1+M2	+0.06 5	$A_2=+0.46$ 1, $A_4=-0.02$ 1, $\text{pol}=-1.04$ 17.
3677.0	717.7 4	5.7 6	M1+E2	-0.19 +5-9	$A_2=-0.17$ 5, $A_4=+0.49$ 26, $\text{pol}=-0.33$ 13.
	3676.8 8	94.3 6	M1+E2	-1.28 2	$A_2=-1.06$ 1, $A_4=+0.34$ 1, $\text{pol}=+0.32$ 8.
3730.9	1268.4 3	32.6 10	M1+E2		δ : +0.32 6 for $J=5/2$, unknown for $J=3/2$. $A_2=+0.18$ 7, $A_4=+0.01$ 7.
	1787.6 5	18.1 12	M1+E2		$A_2=-0.48$ 15, $A_4=-0.20$ 17. δ : -0.27 13 for $J=5/2$; unknown for $J=3/2$.

Continued on next page (footnotes at end of table)

$^{38}\text{Ar}(\alpha, n\gamma)$ 1980Li10, 1977Li07, 1976Li17 (continued) $\gamma(^{41}\text{Ca})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\S$	Mult.#	$\delta^\#$	Comments
3730.9	3730.4 8	49.3 11	(E2)		δ : 0.00 3 for J=5/2; pure E2 for J=3/2. Mult=E2 required by $\Delta J\pi$. $A_2=-0.11$ 33, $A_4=+0.2$ 4, $\text{pol}=+0.29$ 51.
3740.7	1730.5 4	100	M1 (+E2)	<0.4	δ : -0.3 1 for J=5/2; 0.0 2 for J=3/2. $A_2=+0.15$ 5, $A_4=+0.05$ 5, $\text{pol}=+0.29$ 1.
3829.9	460.3 2	100	E2		$A_2=+0.35$ 1, $A_4=-0.19$ 2, $\text{pol}=+0.60$ 11.
3914.2	544.6 4	100	M1 (+E2)	-0.01 3	$A_2=-0.26$ 2, $A_4=-0.02$ 3, $\text{pol}=-0.40$ 3.
3974.5	1368.5 $\frac{3}{2}$ 4	56.9 13	M1+E2	+0.06 3	$A_2=-0.21$ 3, $A_4=-0.02$ 3, $\text{pol}=-0.63$ 16.
	3975.1 $\frac{3}{2}$ 8	43.1 13			
3976.4	606.5 $\frac{3}{2}$ 5	18 8			
	774.6 2	82 8	M1+E2	-0.09 2	$A_2=-0.13$ 2, $A_4=-0.01$ 2, $\text{pol}=-0.43$ 3.
4015.1	4014.9 8	100	E2		$A_2=+0.42$ 2, $A_4=-0.19$ 2, $\text{pol}=+0.85$ 27.
4097.1	2086.6 8				
	4097.3 10				
4277.3	4277.1 10	100	D+Q		$A_2=-0.20$ 3, $A_4=-0.09$ 5, $\text{pol}=+0.32$ 45.
4343.1	4342.9 10	100	M1+E2	+7.3 +12-9	$A_2=+0.25$ 2, $A_4=+0.34$ 2, $\text{pol}=+0.25$ 31.
4415.3	2405.1 6	100			
4451.0	4450.7 10	100			$A_2=-0.28$ 3, $A_4=-0.01$ 3, $\text{pol}=-0.21$ 45.
4519.6	543.6 $\frac{3}{2}$ 4	8 2			
	605.5 4	35 4			
	689.7 3	29 3			
	1149.7 3	28 3	M1+E2	-0.04 2	$A_2=-0.38$ 3, $A_4=0.00$ 4, $\text{pol}=-0.34$ 11.
4550.1	4549.8 10	100			
4733.0	4732.7 11	100			$A_2=-0.18$ 2, $A_4=+0.05$ 3.
4882.9	4882.6 11	100			
4974.9	4974.6 11	100			$A_2=-0.24$ 3, $A_4=+0.02$ 4.
5057.1	5056.8 14	100			
5119.6	5119.3 15	100			
5154.4	5154.1 16	100			
5219.1	1389.2 8	100	M1 (+E2)	<0.04	δ : 0.00 2 for J=17/2, +0.01 3 for J=13/2. $A_2=-0.20$ 3, $A_4=0.00$ 3, $\text{pol}=-0.30$ 14.
5290.3	5289.9 13	100			
5506.5	5506.1 16	100			

† From 1976Li17, unless otherwise stated.

‡ From 1980Li10.

§ From 1980Li10, unless otherwise stated.

From $\gamma(\theta)$ and $\gamma(\text{lin pol})$ data (1980Li10, 1977Li09), combined with RUL.@ From (d,p γ) (1974Mc01) since 444 γ and 445 γ form an unresolved doublet in ($\alpha, n\gamma$).& From (d,p γ) (1975Ta13).

$^{38}\text{Ar}(\alpha, n\gamma)$ 1980Li10, 1977Li07, 1976Li17 (continued)

Level Scheme

Intensities: % photon branching from each level

 $^{41}\text{Ca}_{21}$

$^{39}\text{K}(^3\text{He},\text{p})$ $^{1967}\text{Be}41,^{1966}\text{Se}08$

$J\pi(^{39}\text{K g.s.}) = 3/2^+$.

$^{1967}\text{Be}41$ (also $^{1966}\text{Be}35$): $E(^3\text{He})=13.03$ MeV from MIT-ONR electrostatic generator. Protons detected with nuclear emulsion (FWHM=55 keV). Measured $\sigma(\theta)$. DWBA analysis (code JULIE).

$^{1966}\text{Se}08$: $E(^3\text{He})=14$ MeV from Oak Ridge National Laboratory tandem Van de Graaff accelerator. Protons detected with (E- ΔE) telescope detectors (FWHM=40 keV). Measured $\sigma(\theta)$.

^{41}Ca Levels

E(level) [†]	L [‡]	Comments
0.0	#	
1949 5	#	
2017 5	0	
2471 ^a		
2587 ^a		
2615 ^a		
2680 ^a		
2893 5	2	
2970 ^a		
3059 ^a		
3131 ^a		
3209 ^a		
3378 ^a		
3408 5	0+2	L: Fraction of L values:0.75 10 (L=0), 0.25 10 (L=2).
3536 ^a		
3686 ^a		
3740 5	0+2 [§]	
3859 ^a		
3954 ^a		
4105 5	0+2 [§]	
4343 ^a		
4431 ^a		
4743 10	0+2 [§]	
4829 10	0+2 [§]	
4983 10	2	
5006 ^a		E(level): 5019 in $^{1966}\text{Se}08$ corresponds to 5006+5024.
5024 ^a		
5208 10	@	
5297 10	0+2	L: Fraction of L values:0.35 10 (L=0), 0.65 10 (L=2).
5421 10	0+2	L: Fraction of L values:0.30 10 (L=0), 0.70 10 (L=2).
5477 10	0+2	L: Fraction of L values:0.55 10 (L=0), 0.45 10 (L=2). Not consistent with L=1 in $^{40}\text{Ca}(\text{d},\text{p})$.
5730 10	0+2	L: Fraction of L values:0.50 10 (L=0), 0.50 10 (L=2).
		E(level): 5759 in $^{1966}\text{Se}08$ corresponds to 5730+5759.
5759 ^a		
5832 10	0	
5982 10	0+2	L: Fraction of L values:0.75 10 (L=0), 0.25 10 (L=2).
6091 10	@	
6098 ^a		E(level): 6093 in $^{1966}\text{Se}08$ corresponds to 6091+6098.
6338 10	@	
6488 10	@	
6990&		
7565&		
7762&		
7860&		
7964&		
8062&		
8159&		

[†] Below 6.5 MeV excitation, $^{1967}\text{Be}41$ and $^{1966}\text{Se}08$ quote energies from $^{40}\text{Ca}(\text{d},\text{p})$ work of $^{1965}\text{Be}14$. Above this energy levels are from $^{1966}\text{Se}08$ only.

[‡] From DWBA analysis ($^{1967}\text{Be}41$).

[§] Fraction of L values: 0.90 10 (L=0), 0.10 10 (L=2).

Observed $\sigma(\theta)$ may be L=1, but no analysis was carried out.

@ No L-assignment could be made from observed $\sigma(\theta)$ of $^{1967}\text{Be}41$.

& From $^{1966}\text{Se}08$ only, probably doublets or triplets.

^a Group shown by $^{1966}\text{Se}08$ in proton spectrum.

$^{39}\text{K}(^3\text{He},p\gamma)$ 1971Kn04

1971Kn04: $E(^3\text{He})=12, 13$ MeV from the EN and MP tandem Van de Graaff accelerators at MPI Heidelberg and the FN tandem at Argonne National Laboratory. Detected gammas with Ge(Li) detector (FWHM = 6 keV for 2 MeV γ rays and 9 keV for 4 MeV γ rays). Protons were detected with nuclear emulsions (FWHM ≈ 20 keV) (ANL) and with Si counters (MPI). Measured $E\gamma$, $I\gamma$, $p(\gamma)$ -coin and I_p (given in Figure 12 as horizontal lines with length proportional to the yields).

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	Comments
0.0	$7/2^-$	
1942	$3/2^-$	
2009	$3/2^+$	
2463 [†]	$3/2^-$	
2574	$5/2^-$	
2604	$5/2^+$	
2881	$7/2^+$	
2957 [†]		
3199		
3398	$1/2^+$	
3738		
4091		
4180		
4724 [§]		
4768		
4811		
4876		
4961		
5211?		
5284		
5412		
5470		
5716		
5813	$3/2^+$	E(level): Isobaric analog state (IAS).
5972?		
(6091 [‡])		
6323		
(6488 [‡])		

[†] From Adopted Levels.

[‡] Gamma decay modes were not seen in the γ -ray spectra, even though the level is populated strongly in $^{39}\text{K}(^3\text{He},p)$.

[§] There are two levels, one deexciting through 2715 γ and the other through 4724 γ (see Adopted Levels).

 $\gamma(^{41}\text{Ca})$

E(level)	$E\gamma^\dagger$	$I\gamma$	E(level)	$E\gamma^\dagger$	$I\gamma$	E(level)	$E\gamma^\dagger$	$I\gamma$
1942	1942	100	4768	2759	100	5412	3470	63
2009	2009	100	4811	1930 [‡]		5470	509 [‡]	
2574	2574	100		2802 [‡]			5470	100
2604	2604	100		2869		5716	1536	20
2881	2881	100		4811			3707	55
3199	3199	100	4876	4876	100		3774 [‡]	
3398	1389	100	4961	193 [‡]			5716	25
3738	1134	40		2080	35	5813	1722	55
	1729	60		4961	65		2075	20
4091	1210 [‡]		5211?	2607 [‡]			2415	25
	1487	8		3269 [‡]			3804 [‡]	<5
	2082	58	5284	2085 [‡]		5972?	2574 [‡]	22
	4091	34		3275	100		3368 [‡]	36
4180	1576	30	5412	451 [‡]			3398 [‡]	21
	2171	70		2455 [‡]			3963 [‡]	21
4724	2715	90		2808	37	6323	4381	100
	4724	10		2949 [‡]				

[†] From level-energy differences.

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

$^{39}\text{K}(\alpha, \text{p}\gamma)$ 1971Kn04 (continued)

Level Scheme

Intensities: % photon branching from each level

 $^{39}\text{K}(\alpha, \text{d})$ 1975Na14
 $J\pi(^{39}\text{K g.s.}) = 3/2+$

 1975Na14: $E(\alpha)=40$ MeV from Michigan State University cyclotron. Detected reaction products using the split-pole magnetic spectrograph and wire counter plastic scintillator (FWHM=60 keV). Measured $\sigma(\theta)$. DWBA calculations.

 ^{41}Ca Levels

E(level)	$L^\dagger$	$d\sigma/d\Omega$ ($\mu\text{b/sr}$) ‡	Comments
0.0	5	260	
2010			E(level): From Figure 1.
3370	6	54	
3830	6	230	
3920	6	230	
3970	6	90	
4520	6	240	
4980	4+6	90, 92	
5220	6	800	
5350	6	340	
5520	4	300	
6070	4+6	600, 120	
6480	4+6	280, 60	

 † From DWBA analysis.

 ‡ At 10° .

$^{39}\text{K}(^7\text{Li},\alpha\gamma), ^{40}\text{Ca}(^3\text{He},2p\gamma)$ 1973Bi15

1973Bi15: $E(^7\text{Li})=20$ MeV, $E(^3\text{He})=14.5, 18$ MeV from Tandem laboratory at Munich University. Measured $E\gamma$, $\gamma\gamma$ coin, $\gamma(t)$ with Ge(Li) detectors.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$	Comments
0.0	7/2-		
1942.7 §	3/2-		
2010.1 §	3/2+		
2462.5 §	3/2-		
2670.1 §	1/2+		
3050.1 §			
3200.6 #	9/2+		
3369.0 #	11/2+	<2.8 ns	
3829.7 #	15/2+	3.8 ns 6	
3914.2 #	13/2+		
5220.0	(13/2, 17/2)+		E(level): Populated only in ($^7\text{Li},\alpha\gamma$).

† From Adopted Levels.

‡ From $\gamma(t)$.

§ Populated strongly in ($^3\text{He},2p\gamma$), weak in ($^7\text{Li},\alpha\gamma$).

Populated more strongly in ($^7\text{Li},\alpha\gamma$) than in ($^3\text{He},2p\gamma$).

 $\gamma(^{41}\text{Ca})$

$E\gamma^\dagger$	E(level)	$E\gamma^\dagger$	E(level)	$E\gamma^\dagger$	E(level)
168.4	3369.0	660.0	2670.1	1942.7	1942.7
460.7	3829.7	727.4	2670.1	2010.1	2010.1
519.8	2462.5	1040.0	3050.1	3200.6	3200.6
545.2	3914.2	1390.3	5220.0	3369.0	3369.0

† From level-energy differences.

Level Scheme

$^{40}\text{K}(\text{d},\text{n})$ 1975Bo04 $J\pi(^{40}\text{K g.s.}) = 4^-$.1975Bo04: E(d)=6.5 MeV from CN van de Graaf accelerator at HMI, Berlin. Measured $\sigma(\theta)$ at $\theta = 0^\circ$ – 67.5° and tof.

FWHM=60 keV near 4 MeV excitation energies and 15 keV for 10 MeV excitation energies. DWBA analysis (DWUCK code).

 ^{41}Ca Levels

E(level) [†]	L	(2J+1)S [‡]	Comments
0.0	2		
3831 7	3	12.5	
3915 7	3	8.4	
3976 7	1+3	0.30, 5.7	
4094 7	3(+1)	0.13, 2.7	
4451 7	1	0.20	
4742 7	1+3	0.23, 0.81	
4971 7	1+3	0.27, 3.5	
5059 [#] 7	1+3	0.30, 3.2	
5186 [#] 7	1+3	0.39, 2.3	
5336 7	3(+0)	(0.44)	E(level): Probable doublet. (2J+1)S: for L=0. (2J+1)S: for L=1.
5401 7	1+(3)	0.40	
5537 7	1	3.2	
5714 [#] 7	1	0.20	
5759 7	1+3	1.9	(2J+1)S: for L=3.
5972 7	1+3	1.6	(2J+1)S: for L=3.
6067 7	1+3	1.88, (3.2)	L,(2J+1)S: probably for triplet 6042+6067+6098.
6315 [#] 7	1	0.62	
6527 7	1+3	1.02, 1.8	
6738 7	1+3	0.75, 0.3	
7004 10	1+3	0.78, 2.2	
7100 10	0	0.22	
7280 10	1	0.95	
7380 10	1	0.81	
7415 10	0	0.74	
7533 10	1	0.44	
7572 10	3	2.3	
7774 10			
7990 10	1	0.19	
8040 10	1	0.38	
8187 10	1	0.77	
8292 10	1	0.13	
8388 10	3+1	(4.3)	(2J+1)S: for L=3.
8450 10	1	0.27	
8504 10	1	0.27	
8580 10	1	0.28	
8630 10	1	0.29	
8656 10	1	0.15	
8693 10	1	0.08	
8980 10	1	0.20	
9170 20	1	0.40	
9290 20	1	0.39	
9390 20	1	0.31	
9440 20	1	0.32	
9570 20	1	0.19	
9650 20	1	0.21	
9720 20	1	0.23	
9740 [§] 20			
9880 20	1	0.13	
9910 20	1	0.06	
9920 20	1	0.11	
10300 20	1	0.20	
10325 20	1	0.58	
10390 [§] 20			

[†] Energies are from authors' ($^3\text{He},\text{d}$) data for levels below 7 MeV. Above this energy, the values are from (d,n).[‡] Values are normalized to 13 MeV ($^3\text{He},\text{d}$) data for 3831 level.[§] From Figure 4 of 1975Bo04.[#] From (d,n) data.

$^{40}\text{K}(^3\text{He},\text{d})$ 1975Bo04 $J\pi(^{40}\text{K g.s.}) = 4^-$.

1975Bo04:

 $E(^3\text{He}) = 13$ MeV from the CN Van de Graaff Accelerator at the HMI, Berlin. Deuterons detected with solid-state telescopes (FWHM= 27 keV). Measured $\sigma(\theta)$. DWBA analysis (DWUCK code). $E(^3\text{He}) = 21$ MeV from the Heidelberg MP tandem accelerator. Deuterons detected in nuclear emulsions (FWHM= 30 keV). Measured $\sigma(\theta)$. DWBA analysis (DWUCK code). ^{41}Ca Levels

E(level) [†]	L	(2J+1)S [‡]	Comments
0.0	2		(2J+1)S: 8.0 to 13.0.
2587 7	1+3	0.09, 0.7	L: Inconsistent with Adopted $J\pi=5/2^-$.
2884 7	3	1.5	
3200§ 7			
3369 7	3	2.1	
3400§			
3495 7	1+3	0.07, 0.9	
3615 7	(0+2)		
3737 7	1	0.21	
3831 7	3	12.5	
3915 7	3	8.6	
3976 7	1+3	0.58, 4.8	
4094 7	3(+1)	3.9	(2J+1)S: for L=3.
4451 7	1	0.26	
4742 7	1+3	0.17, 1.4	
4971 7	1+3	4.3	
5186§			
5275 7	(2+4)		
5336 7	(0)+3	5.5, 6.9	
5401 7	1+(3)	0.31, 1.5	
5537 7	1	2.75	
5759 7	1+3	0.20, 2.4	
5809 7	3	3.2	
5920§			
5972 7	1+3	0.34, 2.0	
6042 7	1+3	0.17, 0.9 [#]	
6067 7	1	1.20 [#]	
6098 7	1	0.19 [#]	
6311§			
6330§			E(level): 6311 and 6330 form a doublet.
6400§			
6468 7	1+3	0.47, 1.9 [#]	
6527 7	1+3	0.79, 2.0 [#]	
6738 7	1+3	0.71 [#]	
6851§ 7			
7004 10	1+3	0.78, 1.6 [#]	
7100 10	0		
7173§ 10			
7380 10	1		
7990 10			
8040 10			
8388 10	3+1	0.26, 2.4 [#]	
8450§ 10			
8504§ 10			
8543§ 10			
8630§ 10			
9216§ 20			
9440§ 20			
9640§ 20			
10348§ 20			
10398§ 20			

[†] From 13 MeV data for levels below 7 MeV. Above 7 MeV, values are from authors' (d,n) experiment.[‡] (2J+1)S values for E=21 MeV data. Values are normalized to 13 MeV data for 3831 level.

§ From Figure 1 of 1975Bo04, not listed in Table 2.

For E=13 MeV data.

⁴⁰Ca(n,γ) 1971Ch56

1971Ch56: E(n)=10, 19, 39, 51, 60, 75, 88 keV. Measured primary gammas with Ge(Li) and NaI detectors.
 Others:
 20015Bo03: Cold neutrons. Preliminary results: S(n) and E(γ).
 1992La20: E(n)= 8-44 MeV. Measured σ(θ), γ-asymmetry. Deduced isovector GQR.
 1985Wa12: E(n)= 10 MeV. Measured response function for 18 MeV γ.
 1984We11: E(n)= 2-20 MeV. Measured absolute σ(θ).
 1984Be25: E(n)= 7-28 MeV. Measured σ(θ), deduced parameters for isovector GQR.
 1983FiZQ: (pol n,γ), excitation energies in giant resonance region. Measured σ(θ), Ay(θ). Deduced isoscalar E2 resonance.
 1980Is02: (n,γ). Measured Eγ, Iγ. Deduced Q value.
 1979Je03: (pol n,γ), E(pol n)= 10 MeV. Measured σ(θ), Ay(θ). Deduced E2 contribution in GDR region.
 1978We02 (also 1978We11): E(n)= 8.0, 12.0 MeV. Measured σ(θ).
 1975Ar19: E(n)= 14 MeV. Measured yields, γ(θ).
 1974Be55: E(n)= 6.8-18.2 MeV. Measured cross sections, Eγ.
 1956Br42: E(n)= 0.3-3 MeV. Measured Eγ, Iγ.

⁴¹Ca Levels

ARC=Average Resonance Capture.

E(level) [†]	Comments
0.0	Primary Iγ=1 from ARC.
1943	Primary Iγ=12 from ARC.
2010	Primary Iγ<5 from ARC.
2462	Primary Iγ=16 from ARC.
2575	
2605	
2670	Primary Iγ=5 from ARC.
2959	Primary Iγ=3 from ARC.
3050	Primary Iγ=2 from ARC.
3400	Primary Iγ=3 from ARC.
3495	Primary Iγ=4 from ARC.
3614	Primary Iγ=1 from ARC.
3730	Primary Iγ=5 from ARC.
3845	Primary Iγ=4 from ARC.
3944	Primary Iγ=5 from ARC.
4184	Primary Iγ=3 from ARC.
4603	Primary Iγ=9 from ARC.
4753	Primary Iγ=5 from ARC.
5012	Primary Iγ=4 from ARC.
5078	Primary Iγ=2 from ARC.
8373	E(level): E(n)(lab)=10 keV.
8381	E(level): E(n)(lab)=19 keV.
8401	E(level): E(n)(lab)=39 keV.
8413	E(level): E(n)(lab)=51 keV.
8421	E(level): E(n)(lab)=60 keV.
8436	E(level): E(n)(lab)=75 keV.
8449	E(level): E(n)(lab)=88 keV.

[†] From Adopted Levels for levels up to 5.1 MeV rounded to the nearest keV. Capture states are S(n)+E(n)(c.m.), where S(n)= 8362.82 14 (2012Wa38) with E(n)(lab) from 1971Ch56.

γ(⁴¹Ca)

Eγ [†]	E(level)	Iγ [‡]	Eγ [†]	E(level)	Iγ [‡]	Eγ [†]	E(level)	Iγ [‡]
4429	8373	6 2	4650	8381	2.0 5	4906	8401	2.0 5
4437	8381	2.0 5	4670	8401	1.0 4	4918	8413	11 3
4457	8401	9 2	4682	8413	4 2	4926	8421	14 3
4477	8421	11 3	4718	8449	5	4954	8449	10
4492	8436	7	4759	8373	5.5 20	4973	8373	3.5 10
4527	8373	7.5 20	4767	8381	2.5 10	4981	8381	1.5 5
4535	8381	4.5 10	4787	8401	1.0 4	5001	8401	1.0 3
4555	8401	5 1	4799	8413	6 2	5323	8373	9 2
4567	8413	9 3	4822	8436	7	5331	8381	3 1
4642	8373	7 2	4886	8381	3 1	5351	8401	2.0 8

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(n,\gamma)$ 1971Ch56 (continued)

 $\gamma(^{41}\text{Ca})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$
5711	8381	7 2	5959	8421	9 2	6469	8413	18 4
5731	8401	1.0 3	5974	8436	13	6477	8421	32 6
5775	8381	5.5 20	5987	8449	8	6492	8436	30
5779	8449	7	6370	8381	2.0 5	6505	8449	22
5795	8401	0.5 2	6390	8401	1.0 5	8380	8381	2.0 5
5805	8381	6 2	6402	8413	15 3	8400	8401	1.0 5
5825	8401	2.5 5	6425	8436	9	8412	8413	4.5 20
5911	8373	30 3	6429	8373	5 1	8420	8421	7.5 20
5919	8381	10 2	6437	8381	22 4	8435	8436	7
5939	8401	31 6	6438	8449	5	8448	8449	18
5951	8413	5.5 20	6457	8401	15 4			

[†] From level-energy differences. Recoil energies have been subtracted by evaluators.

[‡] Relative Intensities for each resonance normalized so that $\Sigma I\gamma = \Sigma I\gamma$ in the thermal neutron capture (1997Gr18).

Level Scheme

Intensities: Relative Intensities for each resonance and normalized so that $\Sigma I\gamma = \Sigma I\gamma$ in the thermal neutron capture (1997Gr18)

$^{40}\text{Ca}(\text{n},\gamma),(\text{pol n},\gamma)$ E=thermal 1967Gr16,1970Cr04,1969ArZT1970Cr04: (n, γ). Gammas detected with Ge(Li) detectors. Measured E_γ , I_γ and deduced Q-value.1969ArZT: (n, γ). Gammas detected with Ge(Li) pair spectrometer and anti-Compton spectrometer. Measured E_γ , I_γ .1967Gr16: (n, γ). Gammas detected with Ge(Li) detectors. Measured E_γ , I_γ and deduced Q-value.

Others:

1972St04: (pol n, γ). Measured $\gamma(\text{circ pol})$.1969Ab03: (pol n, γ). Measured $\gamma(\text{circ pol})$.1956Tr33: (pol n, γ). Measured $6420\gamma(\text{circ pol})$.1956Ad49: (n, γ). Measured E_γ , I_γ .1954Ki54, 1952Ki32: (n, γ). Measured E_γ , I_γ . ^{41}Ca Levels

E(level) [§]	$J\pi^\dagger$	Comments
0.0	7/2-	
1942.70 19	3/2-	
2009.8 3	3/2+	
2462.21 23	3/2-	
2576.0 15	5/2-	
2669.89 24	1/2+	
3049.8 14	3/2+	
3400.0 3	1/2+	
3526		
3613.45 24	1/2-	
3738.3 [†] 20		
3844.5 5	1/2+	
3944.3 3	1/2-	
4603.5 6	3/2-	
4752.7 4	1/2-	
4777.8 7	(3/2)+	
5011.3 13	1/2+	
5074?		
5369.0 10		
5451.3? 20		
5468.0 15		
5669.4 15		
(8363.1 3)	1/2+	E(level): From 2012Wa38. $J\pi$: From s-wave neutron capture in ^{40}Ca g.s.

[†] From 1969ArZT.[‡] From Adopted Levels.[§] From least-squares fit to E_γ 's except where noted. $\gamma(^{41}\text{Ca})$ I_γ normalization: Normalized assuming $\Sigma I_\gamma(\text{g.s.}) = 100$.

$E_\gamma^\dagger$	E(level)	$I_\gamma^{\ddagger\#}$	$E_\gamma^\dagger$	E(level)	$I_\gamma^{\ddagger\#}$	$E_\gamma^\dagger$	E(level)	$I_\gamma^{\ddagger\#}$
^x 182			2575.9 [§] 15	2576.0		^x 4559.7 15		0.1
444.5 4	3844.5	0.5	^x 2606.5 2		1.6	4749.4 6	(8363.1)	2.6
519.50 15	2462.21	13.4	2660.3 20	4603.5	1.3	4838.7 [@] 30	(8363.1)	0.5
660.2 6	2669.89	0.8	2768.8 20	4777.8	2.8	^x 4944.4 20		0.8
727.15 17	2669.89	2.1	2809.8 5	4752.7	3.8	4962.7 6	(8363.1)	1.8
943.0 10	3613.45	0.5	3067.3 20	5011.3	0.7	5313.7 30	(8363.1)	0.3
1040.1 15	3049.8	0.3	^x 3083.0 15		0.7	5368.6 [§] 15	5369.0	
1151.24 20	3613.45	1.1	3351.0 15	(8363.1)	0.4	5467.6 [§] 15	5468.0	
1390.16 20	3400.0	2.2	3585.2 6	(8363.1)	1.6	5669.0 [§] 15	5669.4	
1482.0 3	3944.3	1.3	3610.2 4	(8363.1)	6.0	5692.8 8	(8363.1)	1.1
1670.71 20	3613.45	1.3	3736.5 [@] 15	3738.3		5900.4 8	(8363.1)	7.0
1942.64 20	1942.70	88.5	3759.4 5	(8363.1)	3.1	6352.0 30	(8363.1)	0.2
2001.6 4	3944.3	18.9	^x 3947 3		0.4	6420.7 10	(8363.1)	43.5
2009.8 3	2009.8	11.5	4418.8 6	(8363.1)	17.1			
2290.2 8	4752.7	1.6	4517.7 30	(8363.1)	0.7			

[†] Except where noted, gammas are the weighted average of values from 1967Gr16 and 1970Cr04 where the recoil energies in 1967Gr16 have been subtracted by the evaluators.

Footnotes continued on next page

⁴⁰Ca(n,γ),(pol n,γ) E=thermal 1967Gr16,1970Cr04,1969ArZT (continued)

⁴¹Ca (continued)

‡ From 1967Gr16.

§ From 1969ArZT with recoil energies subtracted by the evaluators.

Absolute intensity per 100 neutron captures.

@ Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

⁴⁰Ca(n,n): Resonances 1972Ne04,1974Si26

See compilation by 2006MuZX for full details on the neutron resonances.

1972Ne04 (also 1970Ki14): E(n) for resonances < 2 MeV from Karlsruhe Isochronous Cyclotron. Measured resonances, total cross sections and parameters with TOF spectrometer with neutron detectors (FWHM=0.5 keV at 500 keV to 2.5 keV at 1500 keV). R-matrix analysis.

1974Si26: E(n) for resonances <550 keV. Measured cross sections and resonance parameters. R-matrix analysis.

Others:

1993Ab03: E(n)= 4-20 MeV. Measured level density and cross sections.

1990Ru11: E(n)< 3 MeV. Measured resonance integral.

1976Mu05: E(n)= 2.5-300 keV. Measured cross section and deduced resonance parameters.

1961Wi02: E(n)< 600 keV. 12 resonances reported between 88 and 595 keV.

1962Bo04, 1961Bi06: measured neutron resonances.

Reduced neutron width (θ²) (1972Ne04)

Level	θ ² x1000	Level	θ ² x1000	Level	θ ² x1000
8449	0.10	9088	1.01	9357	0.25
8492	1.38	9092	0.30	9363	0.15
8504	0.10	9102	7.01	9375	0.33
8526	1.20	9109	0.10	9395	0.15
8578	2.38	9116	2.69	9399	0.15
9608	7.90	9136	0.53	9419	0.30
8655	0.79	9144	0.76	9430	3.05
8692	4.64	9166	1.09	9431	2.27
8714	0.49	9169	0.34	9434	1.02
8800	3.96	9173	0.95	9461	2.38
8855	3.05	9184	8.57	9464	3.32
8919	0.43	9199	2.68	9479	0.08
8939	14.10	9204	6.18	9504	0.26
8942	2.07	9210	0.22	9523	0.54
8972	1.86	9220	6.52	9530	1.40
8983	0.50	9226	0.21	9544	2.71
8986	1.77	9249	1.00	9547	0.33
8988	2.00	9265	1.46	9565	3.90
9015	1.56	9281	0.37	9576	0.49
9021	0.64	9285	3.63	9582	1.92
9043	1.40	9298	0.23	9594	1.92
9058	0.12	9309	1.45	9616	2.61
9073	0.11	9332	6.98		
9083	0.74	9342	2.16		

⁴¹Ca Levels

E(level)‡	Jπ	Γ _n (keV)†	L†	E(n)(lab) (keV)†	Comments
8373		0.00065§	≥1§	10.827§ 6	
8383		0.006§	(0)§	20.404§ 16	
8404		0.00085§	(0)§	42.04§ 5	
8446?		0.0034§	≥1§	84.80§ 14	
8449	1/2	0.14§	0§	88.75§ 15	Γ _n (keV): Other: 0.15 keV (1972Ne04).
8451?		0.0009§	≥1§	90.93§ 15	
8461		0.017§	≥1§	101.0§ 2	
8481		0.014§	≥1§	121.3§ 2	

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{n},\text{n}):$ Resonances $^{1972}\text{Ne04},^{1974}\text{Si26}$ (continued) **^{41}Ca Levels (continued)**

E(level) [‡]	J π	Γ_n (keV) [†]	L [†]	E(n)(lab) (keV) [†]	Comments
8491	1/2	3.2 $\S$	0 $\S$	131.6 $\S$	Γ_n (keV): Other: 2.54 (1972Ne04). L: 0 and J π =1/2+ (1972Ne04). Γ_n (keV): Other: 0.19 keV (1972Ne04).
8505		0.17 $\S$	$\geq 1\mathcal{S}$	145.1 $\S$ 3	
8510	1/2	0.023 $\S$	$\geq 1\mathcal{S}$	151.0 $\S$ 3	
8519		0.026 $\S$	$\geq 1\mathcal{S}$	160.5 $\S$ 4	Γ_n (keV): Other: 2.49 keV (1972Ne04).
8527		2.44 $\S$	0 $\S$	168.57 $\S$	
8543		0.029 $\S$	$\geq 1\mathcal{S}$	185.1 $\S$ 4	
8568		0.18 $\S$	$\geq 1\mathcal{S}$	210.2 $\S$ 5	
8573	1/2	7.4 $\S$	0 $\S$	216.15 $\S$	Γ_n (keV): Other: 5.65 keV (1972Ne04). E(n)(lab) (keV): 216.15 (1974Si26) and 220.0 (1972Ne04) are probably the same levels.
8586	1/2	0.30 $\S$	$\geq 1\mathcal{S}$	229.1 $\S$ 6	E(n)(lab) (keV): 241.80 (1974Si26) and 250.0 (1972Ne04) are probably the same levels.
8599		20.0 $\S$	0 $\S$	241.80 $\S$	
8647	1/2	1.8 $\S$	0 $\S$	290.95 $\S$	Γ_n (keV): Other: 2.19 keV (1972Ne04). E(n)(lab) (keV): 290.95 (1974Si26) and 299.0 (1972Ne04) are probably the same levels.
8681	1/2	14.2 $\S$	0 $\S$	326.35 $\S$	Γ_n (keV): Other: 13.65 keV (1972Ne04). E(n)(lab) (keV): 326.35 (1974Si26) and 338.0 (1972Ne04) are probably the same levels.
8709	1/2	1.61 $\S$	0 $\S$	354.50 $\S$	Γ_n (keV): Other: 1.50 keV (1972Ne04). E(n)(lab) (keV): 354.50 (1974Si26) and 360.0 (1972Ne04) are probably the same levels.
8738	1/2	0.45 $\S$	$\geq 1\mathcal{S}$	385.0 $\S$ 13	Γ_n (keV): Other: 13.38 keV (1972Ne04). E(n)(lab) (keV): 435.00 (1974Si26) and 448.0 (1972Ne04) are probably the same levels.
8787		8.2 $\S$	0 $\S$	435.00 $\S$	
8817	1/2	0.45 $\S$	$\geq 1\mathcal{S}$	466.3 $\S$ 18	Γ_n (keV): Other: 10.65 keV (1972Ne04). E(n)(lab) (keV): 501.50 (1974Si26) and 504.0 (1972Ne04) are probably the same levels.
8827		0.60 $\S$	$\geq 1\mathcal{S}$	476.1 $\S$ 18	
8852		8.1 $\S$	0 $\S$	501.50 $\S$	
8885		1.0 $\S$	$\geq 1\mathcal{S}$	535.4 $\S$ 22	L: $\neq 1$.
8908				559.0	
8919	3/2	0.2	1	570.0	
8939	1/2	55.0	0	591.0	
8942	5/2	<0.1	2	594.0	
8963	(3/2)		(2)	615.0	
8972	5/2	<0.1	2	624.0	
8983	1/2	2	0	636.0	
8985	5/2	<0.1	2	638.0	
8988	1/2	1.3	1	641.0	
8999				652.0	
9015	(5/2)	<0.1	2	668.0	
9021	1/2	2.7	0	675.0	
9041	1/2	0.9	1	695.0	
9058	3/2	0.1	1	713.0	
9073	3/2	<0.1	1	728.0	
9083	1/2	3.2	0	738.0	
9088	1/2	4.4	0	743.0	
9092	1/2	0.3	1	747.0	
9102	(3/2)	0.6	2	758.0	
9109	(3/2)	0.1	(1)	765.0	
9116	1/2	12.0	0	772.0	
9136	1/2	2.4	0	793.0	
9143	5/2	0.1	2	800.0	
9166	1/2	3.5	0	823.0	
9169	(1/2)	0.4	(1)	826.0	
9173	(5/2)	0.1	2	830.0	
9184	3/2	0.9	2	842.0	
9199	3/2	0.3	2	857.0	
9204	1/2	29.0	0	862.0	
9210	(1/2)	0.3	1	868.0	

Continued on next page (footnotes at end of table)

⁴⁰Ca(n,n): Resonances 1972Ne04,1974Si26 (continued)
⁴¹Ca Levels (continued)

E(level) [‡]	J π	Γ_n (keV) [†]	L [†]	E(n)(lab) (keV) [†]	E(level) [‡]	J π	Γ_n (keV) [†]	L [†]	E(n)(lab) (keV) [†]
9220	1/2	31.0	0	879.0	9536	3/2	4.0	1	1203.0
9226	3/2	0.3	1	885.0	9544	1/2	5.0	0	1211.0
9249	1/2	1.5	1	908.0	9547	3/2	1.0	1	1214.0
9265	5/2	0.2	2	925.0	9565	3/2	1.0	2	1232.0
9281	1/2	0.6	1	941.0	9576	1/2	1.5	1	1243.0
9285	3/2	0.5	2	945.0	9582	5/2	0.5	2	1250.0
9298	3/2	0.4	1	959.0	9594	(3/2)	0.5	(2)	1262.0
9309	1/2	7.2	0	970.0	9599	(3/2)		1	1267.0
9322				983.0	9616	1/2	15.0	0	1284.0
9332	(3/2)	1.1	(2)	993.0	9620	(3/2)		2	1289.0
9342	1/2	11.0	0	1004.0	9639			(1)	1308.0
9357	(3/2)	0.5	1	1019.0	9649	(1/2)		(0)	1318.0
9363	(1/2)	0.3	(1)	1025.0	9663				1333.0
9375	1/2	0.7	1	1037.0	9667				1337.0
9378				1041.0	9678	3/2		1	1348.0
9383				1046.0	9685				1355.0
9393				1056.0	9704	1/2		0	1375.0
9395	1/2	0.4	(1)	1058.0	9717				1388.0
9399	1/2	0.4	(1)	1062.0	9736	1/2		1	1408.0
9419	3/2	0.7	(1)	1083.0	9752				1424.0
9431	(3/2)	0.6	2	1094.0	9761	1/2	11.0	0	1433.0
9432	1/2	2.0	0	1095.0	9773	3/2		1	1445.0
9434	5/2	0.2	2	1098.0	9779	3/2		1	1452.0
9461	3/2	0.5	2	1126.0	9795				1468.0
9464	3/2	0.7	2	1129.0	9805			1	1478.0
9479	(3/2)		(1)	1144.0	9816			(1)	1489.0
9495	3/2	0.2	1	1160.0	9820				1494.0
9503	3/2	0.7	1	1169.0	9841				1515.0
9523	1/2	3.0	0	1189.0	9856	5/2		2	1530.0

[†] From 1972Ne04, unless otherwise stated.

[‡] S(n)+E(n)(c.m.). S(n)=8362.82 *14* (2012Wa38). E(n)(c.m.) is deduced from E(n)(lab).

[§] From 1974Si26. Uncertainties for Γ_n range between 10–15 % (1974Si26).

⁴⁰Ca(p, π^+),(pol p, π^+) 1974Da23,1979Ho09,1981Sj02

1981Sj02: (pol p, π^+), E(pol p)= 147–159 MeV from Indiana Cyclotron University Facility. Detected pions with magnetic spectrometer and detector telescope. Measured $\sigma(\theta)$, $A_y(\theta)$. DWBA analysis.

1979Ho09: (p, π^+), E(p)= 163–186 MeV. Detected pions with hodoscope and scintillation counters (FWHM= 0.7–1.3 keV). Measured $\sigma(\theta)$ and for g.s. PWBA and DWBA analysis.

1979Pi06 (also 1979PiZU): (p, π^+), E(p)= 140–200 MeV from Indiana Cyclotron University Facility. Detected pions with DD spectrometer. Measured $\sigma(\theta)$.

1976Le05 (also 1975Le25): (p, π^+), E(p)= 149–154 MeV from Orsay IPN synchrocyclotron. Detected pions with magnetic spectrometer and three-scintillator hodoscopes (FWHM=1.5 MeV). Measured $\sigma(\theta)$ for g.s.

1974Da23: (p, π^+), E(p)= 185 MeV from synchrocyclotron. Detected pions with magnetic spectrometer and scintillation counters (FWHM=550 keV). Measured $\sigma(\theta)$ for g.s. and energy spectrum of π^+ .

1979Ma39: (p, π^+), E(p)= 8 and 16 MeV. Measured σ .

⁴¹Ca Levels

E(level)	J $\pi^{\ddagger}$
0.0	7/2–
1940 [†]	3/2–
2010 [†]	3/2+

[†] Unresolved doublet (1974Da23).

[‡] From Adopted Levels.

⁴⁰Ca(d,pγ), ²H(⁴⁰Ca,pγ) 1975Ta13, 1980Sa14, 1974Mc01

Main references:

²H(⁴⁰Ca,pγ): 1978Be20.

⁴⁰Ca(d,pγ): 1987Ta03, 1980Sa14, 1975Ta13, 1974Mc01, 1971Fo09, 1970Jo03.

1987Ta03: (d,pγ), E(d)= 6 MeV from Van de Graaff accelerator at Legnaro National Laboratory, Padova. Detected gammas with HPGe detector (FWHM= 2.3 keV) and protons with two silicon detectors. Measured Ep, Eγ, pγ coin, lifetimes by DSAM.

1980Sa14: (d,pγ), E(d)= 3 MeV from pulsed beam facility at Queen's University 4 MV Van de Graaff accelerator. Gammas detected with Ge(Li). Measured Eγ, Iγ, lifetime.

1978Be20: (⁴⁰Ca,pγ), E(⁴⁰Ca)= 60 MeV from MP tandem Van de Graaff accelerator, Strasbourg. Gammas detected with a Ge(Li) detector (FWHM= 2.7 keV). Measured lifetimes by DSAM.

1975Ta13: (d,pγ), E(d)= 3 MeV from University of Pennsylvania EN tandem accelerator. Protons detected with an annular silicon surface-barrier detector and gammas with a Ge(Li) detector (FWHM= 2.7 keV). Measured pγ coin, Eγ, Iγ and lifetimes by DSAM.

1974Mc01 (also 1972Mc15): (d,pγ), E(d)= 3 MeV. Protons detected with an annular silicon surface-barrier detector and gammas with a Ge(Li) detector (FWHM= 2.7 keV). Measured Eγ, pγ(θ) and branching ratio.

1971Fo09 (also 1971La07, 1968Sc25): (d,pγ), E(d)=3-4.03 MeV from Van de Graaff accelerator at Orsay. Gammas detected with Ge(Li). Measured Eγ, pγ(θ), lifetimes by DSAM.

1970Jo03: (d,pγ), E(d)=4.04 MeV from Orsay 4 MV Van de Graaff accelerator. Protons detected with an annular silicon surface-barrier detector and gammas detected with a NaI(Tl) detector. Measured Eγ, pγ(θ).

Others:

1974Co29: (d,pγ), E(d)= 3.2 MeV. Measured pγ(θ), deduced spin assignments for 1943, 2462, 3944, 4187, 4604 and 4753 levels.

1973Ta17: (d,pγ), E(d)=11 MeV. Measured γ decay of the 3.62 MeV state.

1971Co25: (d,pγ), E(d)< 4 MeV. Measured Eγ and branching ratios.

1967Fr06: (d,pγ), E(d)= 4.8 MeV. Measured pγ(θ), proton polarization. DWBA analysis.

1964Za03: (d,pγ), E(d)= 6.6 MeV. Measured pγ(θ).

1963Le12: (d,pγ). Measured pγ(θ).

1959Ta01: (d,pγ), E=7.78 MeV. Measured pγ(θ) for 1947 level.

⁴¹Ca Levels

E(level) [†]	Jπ [‡]	T _{1/2} [†]	Comments
0.0	7/2-		
1942.4 2	3/2-	0.47 ps 5	T _{1/2} : Weighted average of 0.39 ps 6 (1987Ta03), 0.40 ps 7 (1980Sa14), 0.55 ps 7 (1978Be20), 0.55 ps 5 (1975Ta13), 0.32 ps 10 (1971La07).
2009.7 2	3/2+	506 ps 12	T _{1/2} : From 1980Sa14. Other: > 2.6 ps (1987Ta03).
2462.2 2	3/2-	4.4 ps 6	T _{1/2} : Weighted average of 4.6 ps 6 (1978Be20) and 3.8 ps 11 (1975Ta13). Others: > 1.0 ps (1987Ta03), ≥ 1.0 ps (1971La07).
2574.9 3	5/2-	180 fs 20	
2605.1 3	5/2+	0.39 ps 5	
2669.8 2	1/2+	2.8 ps 6	T _{1/2} : Weighted average of 2.7 ps +7-5 (1975Ta13) and 3.1 ps 9 (1978Be20). Other: 0.33 ps 10 (1971La07).
2883.1 5	7/2+	21 fs 17	
2959.3 4	7/2-	41 fs 13	
3049.1 3	3/2+	1.12 ps +19-15	T _{1/2} : Other: 0.24 ps +30-15 (1971La07).
3200.3 6	9/2+	40 fs 20	
3369.2	11/2+		
3399.8 3	1/2+	82 fs 21	
3494.7 3	5/2+	0.30 ps 6	
3525.3 3	3/2+	33 fs 17	
3613.0 6	7/2+	<19 fs	
3613.5 3	1/2-	0.11 ps 5	T _{1/2} : Weighted average of 0.17 ps 3 (1975Ta13) and 0.067 ps +28-25 (1987Ta03). Other: ≤ 35 fs (1971La07).
3675.7 10	9/2-	53 fs 28	
3730.4 3	3/2-	0.26 ps 5	
3739.4 3	(3/2, 5/2)+		
3829.5	15/2+		
3845.9 6	1/2+	111 fs 31	
3914.7	13/2+		
3943.7 4	1/2-	<37 fs	T _{1/2} : Others: <15 fs (1987Ta03), ≤ 17 fs (1971La07).
3973.3 8	7/2+	88 fs 35	
4017? §			
4094.1 6	5/2+	<20 fs	
4184.2 5	(3/2, 5/2)	39 fs 12	
4279.0 10	(5/2, 7/2, 9/2)-	<26 fs	

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{d},\text{p}\gamma), ^2\text{H}(^{40}\text{Ca},\text{p}\gamma)$ 1975Ta13,1980Sa14,1974Mc01 (continued)

 ^{41}Ca Levels (continued)

E(level) [†]	Jπ [‡]	T _{1/2} [†]	Comments
4327.5 8		<111 fs	
4340.0 12	9/2-	132 fs 35	
4417.0 4	3/2+	42 fs 10	
4446.6 18	9/2+	<101 fs	
4546.7 10		87 fs 31	
4603.0 5	3/2-	<37 fs	T _{1/2} : Other: < 53 fs (1987Ta03).
4728.1 6	(3/2)+	<30 fs	
4730.2 4	(5/2)+	40 fs 13	
4752.5 4	1/2-	30 fs 10	T _{1/2} : Other: <24 fs (1987Ta03).
4778.1 5	(3/2)+	<15 fs	
4813.9 10	5/2+	<37 fs	
4876.2 8	5/2-	<34 fs	
4969.5 10	9/2+	<25 fs	
5011?§			
5069?§			
5120.1 5	3/2-	<46 fs	
5159?§			
5218.7	(13/2, 17/2)+		
5282.3 5	5/2+	<37 fs	
5411.4 6	5/2+	<30 fs	
5464?§			
5480?§			
5643?§			
5751?§			
5800?§			

[†] From 1975Ta13, unless otherwise stated.

[‡] From Adopted Levels.

§ From 1971Fo09 only. This level is treated as questionable by the evaluators since it is not confirmed in later higher-resolution studies of 1975Ta13 and 1974Mc01.

 $\gamma(^{41}\text{Ca})$

A₂ values are from 1974Mc01. Mixing ratio limits are also deduced by 1974Mc01 from γ(θ) data.

E(level)	Eγ [†]	Iγ [‡]	Comments
1942.4	1942.4	100	A ₂ =+0.10 3.
2009.7	2009.6	100	A ₂ =+0.02 4.
2462.2	519.8	100	A ₂ =+0.27 1.
2574.9	2574.8	100	A ₂ =+0.35 4.
2605.1	2605.0	100	A ₂ =-0.19 4.
2669.8	660.1	29 2	A ₂ =-0.03 4.
	727.4	71 2	A ₂ =-0.03 4.
2883.1	2883.0	100	A ₂ =+0.19 9. Other: +0.21 8 (1970Jo03).
2959.3	2959.2	100	A ₂ =+0.11 6. Other: +0.29 3 (1970Jo03).
3049.1	379.3	3 1	A ₂ =-0.24 24.
	444.0	30 2	A ₂ =-0.04 3.
	1039.4	41 2	A ₂ =-0.03 4. Other: 0.00 3 (1970Jo03).
	1106.7	26 2	A ₂ =+0.14 7.
	3049&a		Eγ: 3052 3 (1971Fo09).
3200.3	594 ^a	≤5	Eγ,Iγ: from 1970Jo03.
	1256 ^a	≤2	Eγ,Iγ: from 1970Jo03.
	3200.2	100	A ₂ =-0.20 7. Other: -0.25 3 (1970Jo03).
3369.2	168.9	62	
	3369.1	38	
3399.8	1390.1	100	A ₂ =+0.10 7.
3494.7	445.6	12@ 3	
	1485.0	83@ 6	A ₂ =+0.06 6.
	3494.5	5@ 2	
3525.3	855.5	10 2	
	1515.6	35 3	
	1582.9	55 3	A ₂ =+0.12 11.

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{d},\text{p}\gamma), ^2\text{H}(^{40}\text{Ca},\text{p}\gamma)$ 1975Ta13,1980Sa14,1974Mc01 (continued) $\gamma(^{41}\text{Ca})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\ddagger}$	Comments
3613.0	3612.8	100	$A_2=+0.31$ 9. Other: +0.26 4 (1970Jo03), +0.33 6 (1972Mc15).
3613.5	943.7	16 § 2	$A_2=-0.05$ 16. Other: +0.01 21 (1972Mc15).
	1151.3	33 § 4	$A_2=+0.15$ 20 (1972Mc15).
	1671.1	51 § 4	$A_2=-0.16$ 10. Other: +0.03 11 (1972Mc15).
3675.7	3675.5	100	$A_2=-0.44$ 8. Other: -0.67 10 (1972Mc15).
3730.4	1155.5	24 # 7	$A_2=-0.45$ 20 (1972Mc15).
	1268.2	35 # 6	$A_2=+0.06$ 10. Other: +0.17 9 (1972Mc15).
	1788.0	17 # 4	
	3730.2	24 # 4	$A_2=+0.05$ 8. Other: +0.05 8 (1972Mc15).
3739.4	1134.3	34 3	$A_2=-0.13$ 8 (1972Mc15).
	1729.7	66 3	$A_2=-0.05$ 14. Other: -0.03 11 (1972Mc15).
3829.5	460.3	100	
3845.9	1836.2	80 5	
	1903.5	20 5	
3914.7	545.5	100	
3943.7	1273.9&a	2 1	E_{γ} : 1280.0 15 (1971Fo09).
	1481.5	9 3	
	2001.2	91 3	
3973.3	1368.2	50 7	
	3973.1	50 7	
4017?	1555&a	100	E_{γ} : 1565.0 15 (1971Fo09).
4094.1	2084.3	58 5	
	4093.9	42 5	
4184.2	1579.1	31 3	
	2174.4	69 3	
4279.0	1673.9&a		I_{γ} : $I(\gamma)(1674)/I(\gamma)(4279)=18$ 10/82 10 (1971Fo09).
			E_{γ} : 1684.0 25 (1971Fo09).
	4278.8	100	
4327.5	1127.2	100	
4340.0	4339.8	100	
4417.0	1811.9	30 2	
	2407.2	70 2	
4446.6	4446.3	100	
4546.7	4546.4	100	
4603.0	1933&a		I_{γ} : $I(\gamma)(1933)/I(\gamma)(2660)=20$ 10/80 10 (1971Fo09).
			E_{γ} : 1943.0 15 (1971Fo09).
	2660.5	100	
4728.1	2718.3	100	
4730.2	2267.9	43 6	
	2787.7	39 5	
	4729.9	18 4	
4752.5	2290.2	33 2	
	2810.0	67 2	
4778.1	2768.3	100	
4813.9	1930.8	59 7	
	4813.6	41 7	
4876.2	4875.9	100	
4969.5	2086.3	58 19	
	4969.2	42 19	
5011?	1611&a	45 12	E_{γ} : 1618.0 15 (1971Fo09).
	3001&a	55 12	E_{γ} : 3012.0 15 (1971Fo09).
5069?	5069&a	100	E_{γ} : 5058 3 (1971Fo09).
5120.1	2450.2	59 10	
	5119.8	41 10	
5159?	5159&a	100	E_{γ} : 5171 3 (1971Fo09).
5218.7	1389.2	100	
5282.3	3272.5	100	
5411.4	3468.8	100	
5464?	5464&a	100	E_{γ} : 5472 3 (1971Fo09).
5480?	2431&a	80 8	E_{γ} : 2437 3 (1971Fo09).
	5480&a	20 8	E_{γ} : 5490 4 (1971Fo09).
5643?	5643&a	100	E_{γ} : 5667 3 (1971Fo09).
5751?	5751&a	100	E_{γ} : 5782 3 (1971Fo09).

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{d,p}\gamma), ^2\text{H}(^{40}\text{Ca,p}\gamma)$ 1975Ta13,1980Sa14,1974Mc01 (continued)

$\gamma(^{41}\text{Ca})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\ddagger}$	Comments
5800?	5800&a	100	E_{γ} : 5813 3 (1971Fo09).

$\dagger$ From level-energy differences. Recoil energies have been subtracted by evaluators.

$\ddagger$ Branching ratios from 1975Ta13, unless otherwise stated.

$\S$ From 1973Ta17.

$\#$ From 1972Mc15.

$@$ From 1971La07.

$\&$ From 1971Fo09 only. E_{γ} is from level-energy difference. Experimental E_{γ} quoted by 1971Fo09 is given under comments which differs significantly from that obtained from level-energy difference. This γ is treated as questionable by the evaluators since it is not confirmed in any of the other studies.

a Placement of transition in the level scheme is uncertain.

$^{40}\text{Ca}(\text{d},\text{p}\gamma), ^2\text{H}(^{40}\text{Ca},\text{p}\gamma)$ 1975Ta13,1980Sa14,1974Mc01 (continued)

Level Scheme

Intensities: % photon branching from each level

$^{41}_{20}\text{Ca}_{21}$

$^{40}\text{Ca}(\text{d,p}\gamma), ^2\text{H}(^{40}\text{Ca,p}\gamma)$ 1975Ta13,1980Sa14,1974Mc01 (continued)

Level Scheme (continued)

Intensities: % photon branching from each level

40Ca(pol d,p),(d,p) 1990Ec01,1994Uo01,1965Be14

Main references:

- 1994Uo01: (pol d,p), E(pol d)=56 MeV from AVF cyclotron, Osaka University. Measured $\sigma(\theta)$, $A_y(\theta)$ for $\theta(\text{lab})$ between 5° and 45°. Protons were detected with two position sensitive proportional counters, a gaseous ΔE counter and plastic E counter (FWHM= 30 keV) DWBA analysis (DWUCK code). Deduced C²S values. A total of 91 levels reported up to 9.7 MeV.
- 1990Ec01 (also 1989Ec02,1987He25): (pol d,p), E(pol d)= 20 MeV from Munich MP-tandem facility. Protons detected with a proportional detector and a plastic scintillator (FWHM=6-8 keV). Measured $\sigma(\theta)$, $A_y(\theta)$ for θ between 5° and 55°. DWBA and CCBA analysis. A total of 183 levels were reported.
- 1965Be14 (also 1968Be36): (d,p), E(d)=7.0, 7.2 MeV from MIT-ONR Van de Graaff accelerator. Reaction protons detected with nuclear emulsion plates. Measured $\sigma(\theta)$. DWBA analysis (JULIE code) A total of 119 levels reported with L-transfers and s-factors deduced for 34 of these levels.
- 1974Br19: (d,p), E(d)=10 MeV. Measured $\sigma(\theta)$ with multigap spectrograph (FWHM=12 keV). DWBA analysis.
- 1974Se12 (also 1973Se09): (d,p), E(d)=11 MeV from Argonne National Laboratory FN tandem. Reaction protons detected with the split-pole spectrograph and photographic plates (FWHM=28-30 keV). Measured $\sigma(\theta)$. DWBA analysis.
- 1970Se01: (d,p), E(d)= 9.8-12.12 MeV from Saclay EN tandem Van de Graaff accelerator. Reaction protons detected with two thick surface barrier silicon detectors (FWHM=28-30 keV). Measured $\sigma(\theta)$. DWBA analysis.
- 1975Ha14: (d,p), E(d)= 12 MeV from Niels Bohr tandem accelerator. Reaction protons detected with a broad range spectrograph (FWHM=15 keV). Measured $\sigma(\theta)$ for $\theta=5^\circ-100^\circ$. Identified 94 levels. DWBA analysis (DWUCK code).
- 1972Ko41 (also 1971Ko20, 1970Ko11, 1970KoZU): (pol d,p), E(pol d)=5,9,10,11 MeV from University of Wisconsin tandem accelerator. Reaction protons detected with two silicon surface-barrier and two Si(Li) detectors (FWHM =300 keV (1972Ko41), 125 keV (1971Ko20), 50 keV (1970Ko11), 40-80 keV (1970KoZU)). Measured $\sigma(\theta)$, $A_y(\theta)$. DWBA analysis.

Others:

- 1991NaZZ: (d,p), E(d)=25 MeV. Measured $\sigma(\theta)$.
- 1990Na34: (pol d,p), E(pol d)= 18 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$. Coupled-channel and DWBA analysis.
- 1984Ha26: (pol d,p), E(pol d)=56 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$. DWBA analysis for g.s.
- 1983Ca20: (pol d,p) E(pol d)=4 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$ for g.s., 1940, 3610 and 3940 levels. DWBA analysis.
- 1980Im01: (d,p), E(d)= 4.50-5.43 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1978Vo04: (pol d,p), E(pol d)= 11 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$. DWBA analysis.
- 1977YaZR: (d,p), E(d)= 1.4-4.5 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1977Sc05: (d,p), E(d)= 2.5 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1976Bo33: (pol d,p), E(pol d)= 11 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$. CCBA analysis.
- 1976Os01 (also 1977Os04): (d,p), E(d)=7.0 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1973Me22: (pol d,p), E(pol d)= 5-12 MeV. Measured $A_y(\theta)$. DWBA analysis.
- 1973Jo10: (pol d,p), E(pol d)= 12.3 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$. DWBA analysis.
- 1971Br44: (pol d,p), E(pol d)= 12.3 MeV. Measured $A_y(\theta)$. DWBA analysis.
- 1970Ro09, 1968Le12: (d,p) E(d)=4.8, 5 MeV. Measured $\sigma(\theta)$ and proton polarization. DWBA analysis.
- 1970Ku11: (d,p), E(d)= 5.58, 6.50 MeV. Measured proton polarization.
- 1970Ke04: (d,p), E(d)= 10.8 MeV. Measured proton polarization.
- 1970Br27: (d,p), E(d)= 12 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1969Go20: (d,p), E(d)= 2 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1969Fo05: (d,p), E(pol d)= 11 MeV. Measured $\sigma(\theta)$ and proton polarization.
- 1969Cu10: (pol d,p), E(pol d)= 5, 6.5, 10 MeV. Measured $A_y(\theta)$. DWBA analysis.
- 1968Le05: (d,p), E(d)= 5.0, 6.0, 6.5 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1968Yu01: (pol d,p), E(pol d)= 8 MeV. Measured $A_y(\theta)$. DWBA analysis.
- 1968Kl03: (d,p), E(d)= 9-11 MeV. Measured $\sigma(\theta)$, $A_y(\theta)$.
- 1968An10: (d,p), E(d)= 10 MeV. Measured $\sigma(\theta)$.
- 1966Ni02: (d,p), E(d)= 12.8 MeV. Measured $\sigma(\theta)$.
- 1965Ru01: (d,p), E(d)= 4.1, 4.7 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1965Hj01: (d,p), E(d)= 14.3 MeV. Measured $s(\theta)$ and proton polarization.
- 1965Fo10: (d,p), E(d)= 1.8-2.0 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1964ZA03: (d,p), E(d)= 6.6 MeV.
- 1964Sc12: (d,p), E(d)= 11.8 MeV. Measured $\sigma(\theta)$. PWBA analysis.
- 1964Le12: (d,p), E(d)= 7.0,8.0,9.0,10.0,11.0,12.0 MeV. Measured $\sigma(\theta)$. DWBA analysis.
- 1964Be08: (d,p), E(d)= 10 MeV. Measured $\sigma(\theta)$ and polarization of protons. DWBA analysis.
- 1963Za03: (d,p), E(d)= 13.6 MeV.
- 1962Pa12: (d,p), E(d)= 13.8 MeV. Measured proton polarization.
- 1958Hi74: (d,p), E(d)= 8.9 MEV. Measured proton polarization.
- 1957Bp01: (d,p), E(d)= 7 MeV. Measured $\sigma(\theta)$, deduced L-transfers for 10 groups.
- 1957Te01 (also 1958Te13): (d,p), E(d)= 1.3, 2.2, 4.0 MeV. Measured $\sigma(\theta)$ for g.s.
- 1956Br97: (d,p), E(d)=2.5-7 MeV. Measured proton spectrum and excitation energy.
- 1953Ho48: (d,p), E(d)= 8.1 MEV. Measured $\sigma(\theta)$.
- 1949Sa19: (d,p), E(d)= 3.9 MeV. Deduced Q value.

Cross section data from 1990Ec01					
Level	$\sigma(20^\circ)$	$\sigma(30^\circ)$	Level	$\sigma(20^\circ)$	$\sigma(30^\circ)$
	$\mu\text{b/sr}$	$\mu\text{b/sr}$		$\mu\text{b/sr}$	$\mu\text{b/sr}$
=====					

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{pol d,p}),(\text{d,p})$ 1990Ec01,1994Uo01,1965Be14 (continued)					
0	7230	6300	6354.1	c	5
1942.7	6649	2252	6376.7	162	118
2009.8	334	88	6400.7	18	20
2462.6	2069	852	6410.9	7	c
2574.2	28	20	6437.9	584	240
2606.5	16	12	6450.7	525	256
2670.5	107	128	6483.4	40	19
2884.2	80	88	6520.6	292	132
2959.8	26	26	6567.4	695	250
3050.4	c	6	6602.6	13	c
3200.4	159	204	6614.2	10	c
3368.2	21	23	6628.6	38	8
3399.8	109	155	6647.0	227	83
3494.5	22	7	6674.3	101	27
3526.0	39	31	6686.2	465	199
3613.5	388	266	6729.2	75	40
3730.3	c	104	6748.1	340	147
3829.2	12	9	6792.9	97	35
3845.7	26	21	6806.7	24	18
3914.9	23	c	6827.1	c	7
3943.9	2628	c	6851.8	c	11
3974.3	20	c	6869.5	c	117
4014.9	12	c	6901.2	c	18
4093.3	66	29	6917.3	c	99
4278.0	35	29	6931.8	c	16(55°)
4329.8	c	6	6990.6	291	c
4418.3	c	4	7014.8	359	c
4448.5	c	132	7026.5	47	c
4520.6	c	5	7041.0	50	c
4602.9	492	c	7073.1	100	c
4733.5	65	65	7092.7	37	c
4753.4	918	462	7107.8	11	c
4778.1	165	29	7115.8	6	c
4817.1	135	43	7137.5	111	c
4830.7	51	16	7164.2	77	c
4878.3	1010	394	7176.1	24	c
4970.5	607	595	7190.7	93	c
4995.1	7	11	7237.8	159	67
5013.6	19	c	7267.6	27	3
5046.9	36	32	7295.8	145	72
5072.3	47	23	7308.4	561	221
5078.4	31	12	7340.6	54	10
5095.3	59	16	7365.3	c	111
5120.7	32	17	7377.1	252	182
5148.1	39	29	7392.9	366	85
5157.0	12	7	7417.1	227	58
5194.9	265	277	7437.3	c	35
5217.3	6	9	7459.0	c	5
5283.3	c	81	7487.5	c	2
5304.7	c	4	7508.8	c	129
5339.7	c	3	7524.7	c	74
5349.7	c	2(55°)	7537.9	c	413
5370.3	c	10(55°)	7576.4	c	3
5411.5	140	c	7607.6	c	20(55°)
5451.7	127	c	7631.3	c	33(55°)
5468.9	348	c	7657.0	c	27(55°)
5482.2	123	c	7678.6	c	3(55°)
5504.2	5	c	7706.7	c	2(55°)
5519.9	105	c	7731.7	c	11(45°)
5539.9	9	c	7751.0	c	81(45°)
5588.5	13	13	7770.3	c	32(45°)
5615.8	32	18	7817.1	1385	c
5648.8	1290	557	7887.8	107	c
5670.1	102	50	7919.1	233	c
5685.9	18	18	7956.8	347	c
5704.0	288	147	7974.1	78	c
5719.0	287	125	7994.8	50	c
5728.3	113	36	8047.5	213	100

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$^{40}\text{Ca}(\text{pol d,p}),(\text{d,p})$ 1990Ec01,1994Uo01,1965Be14 (continued)

5750.9	180	150	8063.4	560	236
5759.6	424	167	8101.8	44	19
5801.2	893	420	8119.7	212	76
5866.1	c	5(45°)	8136.1	325	135
5891.6	105	48	8150.8	439	202
5910.1	18	c	8179.0	131	36
5933.2	106	36	8199.7	110	47
5975.9	166	42	8229.4	151	52
6004.6	33	14	8242.2	c	26
6013.0	15	19	8258.6	c	9(55°)
6036.0	44	31	8312.7	c	17
6065.9	23	35	8335.7	478	151
6083.3	78	c	8373.5	191	40
6098.7	16	10	8402.2	124	50
6140.6	42	14	8447.4	145	125
6148.0	108	8	8467.4	113	63
6164.1	c	6	8522.4	339	113
6179.8	130	82	8549.0	487	229
6192.9	5	53	8584.6	163	89
6208.2	32	c	8619.6	943	405
6238.8	204	86	8637.8	1217	525
6272.9	13	8	8673.5	c	6(45°)
6284.0	20	4	8699.6	170	71
6295.9	17	6			

c: Either contaminated, poor statistics or poor resolution.

 ^{41}Ca Levels

E(level) [†]	$J\pi^{\ddagger}$	$L^{\ddagger}$	(2J+1)S [‡]	Comments
0.0	7/2-	3	6.82	(2J+1)S: 1990Ec01 quote value from a thesis by N. Seichert (University of Munich 1982) from 21 MeV data. Others: 6.8 (1990En08). C ² S=0.59 (1984Ha26), 0.57 (1978Vo04), 0.77 (1994Uo01).
1942.7 3	3/2-	1	2.14	(2J+1)S: 2.6 (1990En08), 2.3 (1978Vo04). C ² S=0.54 (1994Uo01).
2009.8 8	3/2+	2	0.26 [#]	(2J+1)S: 0.33 (1990En08). C ² S=0.14 (1994Uo01).
2462.6 3	3/2-	1	0.67	(2J+1)S: 0.89 (1990En08), 0.80 (1978Vo04). C ² S=0.20 (1994Uo01).
2574.2 10	5/2-	3	0.03	(2J+1)S: (0.04) (1990En08).
2606.5 11		(2)	(0.03)	L,(2J+1)S: from 1990En08. 1990Ec01 give L=2, $J\pi=5/2+$ and assign as pure CCBA.
2670.5 11	1/2+	0	0.03 [#]	(2J+1)S: 0.025 (1990En08). C ² S=0.084 (1994Uo01).
2884.2 8	9/2+	4	0.12	$J\pi$: 7/2+ in Adopted Levels. (2J+1)S: 0.16 (1990En08).
2959.8 7		(3)	(0.06)	L,(2J+1)S: from 1990En08.
3050.4 23				$J\pi$: (3/2+) from 1994Uo01. C ² S=(0.092).
3131?& 5				
3200.4 5	9/2+	4	0.21	(2J+1)S: 0.3 (1990En08). C ² S=0.0083 (1994Uo01).
3368.2 5				
3399.8 14	1/2+	0	0.03 [#]	(2J+1)S: 0.03 (1990En08). C ² S=0.12 (1994Uo01).
3494.5 21	5/2+	2	0.01	
3526.0 6		(2)		L, $J\pi$: from 1990En08. 1990Ec01 give L=2, $J\pi=5/2+$ and assign as pure CCBA. 1994Uo01 assign 3/2+ with C ² S=0.038.
3613.5 5	1/2-	1	0.13	(2J+1)S: 0.17 (1990En08). C ² S=0.092 (1994Uo01).
3686?& 5				
3730.3 8	3/2-	1	0.06	(2J+1)S: 0.02 (1990En08). C ² S=0.027 (1994Uo01).
3740?& 5		2	0.024	(2J+1)S: From 1990En08. A misprint for (2J+1)S in 1990En08. $J\pi$: 5/2+ assigned by 1972Ko41.
3829.2 11				
3845.7 12	1/2+	0	0.01 [#]	(2J+1)S: 0.01 (1990En08). C ² S=0.076 (1994Uo01).
3914.9 17				
3943.9 4	1/2-	1	0.87	(2J+1)S: 1.1 (1990En08), 0.90 (1978Vo04). C ² S=0.57 (1994Uo01).
3974.3 13				
4014.9 19				
4093.3 14	(5/2)+	2	(0.03)	$J\pi$: 1/2- (1994Uo01), C ² S=0.035 for 4109 level.
4198?& 10		1	0.017	L,(2J+1)S: From 1965Be14.
4278.0 4	(9/2)+	4	(0.04)	$J\pi$: adopted $J\pi=(5/2,7/2,9/2)+$.
4329.8 15				

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{pol d,p}),(\text{d,p})$ 1990Ec01,1994Uo01,1965Be14 (continued) ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	$L^{\ddagger}$	(2J+1)S [‡]	Comments
4357?& 10				
4418.3 8	3/2+	2	0.03	
4448.5 7	9/2+	4	0.12	C ² S=0.0074 (1994Uo01).
4520.6 16				E(level): 4559 (1994Uo01).
4561?& 10				
4602.9 3	3/2-	1	0.12	(2J+1)S: 0.16 (1990En08). C ² S=0.14 (1994Uo01), possible misprint for energy level(5601.7) in 1994Uo01, evaluators assume it is 4601.7.
4733.5 10	(9/2)+	4	(0.07)	J π : (5/2)+ in Adopted Levels.
4753.4 2	1/2-	1	0.27	(2J+1)S: 0.37 (1990En08). C ² S=0.29 (1994Uo01).
4778.1 7	(3/2)+	2	(0.11)	(2J+1)S: (0.04) (1990En08).
4817.1 9	5/2+	2	0.06	J π : 3/2+ (1994Uo01), C ² S=0.035 for 4818 level.
				(2J+1)S: 0.07 (1990En08).
4830.7 9	(3/2)+	2	(0.03)	
4878.3 7	(5/2)-	3	(0.38)	(2J+1)S: 0.51 (1990En08). C ² S=0.091 (1994Uo01).
4944?& 10				
4970.5 12	9/2+	4	0.51	(2J+1)S: 1.2 (1990En08). C ² S=0.029 (1994Uo01).
4995.1 18				
5014 3	1/2+	0	0.01 [#]	(2J+1)S: 0.004 (1990En08). C ² S=(0.17) (1994Uo01).
5046.9 10	(9/2)+	4	(0.04)	L: 0 for a 5059 group (1965Be14).
				J π : (1/2+) (1994Uo01), C ² S=(0.11) for 5054 level.
				L: 0 for a 5082 group (1965Be14).
5072.3 9	1/2-	1	0.02	
5078.4 25	1/2-	1	0.02	
5095.3 10	3/2+	2	0.04	
5120.7 12	3/2-	1	0.02	
5148.1 16	7/2-	3	0.02	
5157 3				
5194.9 8	9/2+	4	0.24	C ² S=0.029 (1994Uo01).
5217.3 14				
5283.3 8	(5/2)+	2	(0.11)	(2J+1)S: 0.08 (1990En08).
5305 4				
5339.7 16				
5349.7 13				
5370.3 8	3/2-	1	0.02	(2J+1)S: 0.04 (1990En08).
5411.5 7	3/2+	2	0.09	J π : (1/2-) (1994Uo01), C ² S=(0.028) for 5404 level. However, 1994Uo01 associate 5404 group with 5451.7 from 1990Ec01. J π =5/2+ in Adopted Levels.
5451.7 11	1/2-	1	0.04	(2J+1)S: 0.05 (1990En08).
5468.9 9	3/2-	1	0.09	(2J+1)S: 0.11 (1990En08).
5482.2 13	(3/2)+	2	(0.06)	
5504.2 9				
5519.9 13	(5/2)-	3	(0.06)	J π : (7/2-,5/2-) (1994Uo01), C ² S=(0.0027) for 7/2, (0.0072) for 5/2 for 5513 level.
5540 4				
5588.5 21	(9/2)+	4	(0.02)	
5616 4	(5/2)-	3	(0.02)	
5648.8 13	5/2-	3	(0.69)	(2J+1)S: 1.2 (1990En08). C ² S=0.12 (1994Uo01).
5670.1 9	3/2-	1	0.03	(2J+1)S: 0.04 (1990En08).
5686 3				
5704.0 9	1/2-	1	0.09	(2J+1)S: 0.10 (1990En08).
5719.0 11	(5/2)-	3	(0.17)	
5728.3 18	5/2+	2	0.04	
5750.9 15	9/2+	4	0.15	J π : (9/2+,5/2-) (1994Uo01), C ² S=(0.011) for 9/2, (0.0081) for 5/2 for 5748 level.
5759.6 11	(5/2)+	2	(0.16)	
5801.2 15	5/2-	3	(0.49)	(2J+1)S: 0.52 (1990En08). C ² S=0.081 (1994Uo01).
5832 10				E(level): from 1965Be14 only.
5866 3				
5891.6 14	1/2-	1	0.03	(2J+1)S: 0.04 (1990En08).
5910 3				
5920?& 10				E(level): Probably the same as 5933.2 level.
5933.2 10	(5/2)-	3	(0.06)	
5975.9 12	(3/2)+	2	(0.06)	J π : (3/2,5/2)+ in Adopted Levels.
6004.6 13	1/2-	1	0.01	L: 0 for a 6011 level (1965Be14).
6013 3				

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{pol d,p}),(\text{d,p})$ 1990Ec01,1994Uo01,1965Be14 (continued) ^{41}Ca Levels (continued)

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$L^\ddagger$	$(2J+1)S^\ddagger$	Comments
6036.0 17	(9/2)+	4	(0.03)	
6065.9@ 22				
6083.3 23	(3/2)+	2	(0.04)	
6098.7 14				
6140.6 16		3	0.03	$J\pi$: 2J=4 is a misprint in 1990Ec01.
6148.3				
6164.1 21				
6179.8 13	1/2-	1	0.04	(2J+1)S: 0.05 (1990En08).
6192.9 11				
6208.2 13	3/2-	1	0.01	
6238.8 8	5/2-	3	0.10	$C^2S=0.017$ (1994Uo01).
6272.9 12	5/2-	3	0.01	
6284.0 17	(5/2)+	2	(0.01)	
6295.9 21	7/2-	3	0.01	
6330?& 10				
6354.1 24	5/2+	2	0.01	
6376.7 10	1/2-	1	0.05	
6400.7 13	(9/2)+	4	(0.02)	
6410.9 4		<3		$E(\text{level})$: uncertainty seems underestimated in view of very weak group.
6437.9 7	5/2-	3	0.26	
6450.7 14	5/2-	3	0.24	$C^2S=0.061$ (1994Uo01).
6473?& 10				
6483.4@ 22				
6520.6 11	5/2-	3	0.14	$C^2S=0.035$ (1994Uo01).
6555?& 10				
6567.4 13	7/2-	3	0.29	L: 2 for a 6568 level (1965Be14). $J\pi$: 5/2- (1994Uo01), $C^2S=0.037$ for 6571 level.
6602.6 15		>2		
6614.2 16		>2		
6628.6@ 24				
6647.0 20	5/2-	3	0.10	$C^2S=0.015$ (1994Uo01).
6674.3 13	5/2+	2	0.03	
6686.2 8	7/2-	3	0.17	$J\pi$: 5/2- (1994Uo01), $C^2S=0.031$ for 6699 level.
6699?& 10				
6729.2 10	7/2-	3	0.03	
6748.1 9	7/2-	3	0.12	$J\pi$: 5/2- (1994Uo01), $C^2S=0.024$ for 6758 level.
6792.9 19	(5/2)+	2	(0.03)	
6806.7 15	(3/2)+	2	(0.02)	
6827.3				
6851.8 15	5/2+	2	0.02	
6869.5 10	(5/2)-	3	(0.12)	$J\pi$: 5/2-,3/2- (1994Uo01), $C^2S=0.016$ for 5/2, (0.0010) for 3/2 for 6884 level.
6901.2 24	5/2+	2	0.02	
6917.3 25	(9/2)+	4	(0.08)	
6931.8@ 19				
6990.6 10	5/2-	3	0.13	
7014.8 7	(9/2)+	4	(0.21)	$C^2S=0.025$ (1994Uo01) for 7030 level.
7026.5 15				
7041.0 5	3/2-	1	0.02	
7073.1 25	1/2-	1	0.03	$E(\text{level})$: 1994Uo01 associate a 7114 level with 7073 from 1990Ec01.
7092.7 18	(9/2)+	4	(0.03)	
7107.8 25				
7115.8 23				
7137.5 27	5/2+	2	0.04	
7164.2 21	(9/2)+	4	(0.05)	
7176.1 10				
7191.3	1/2-	1	0.03	$J\pi$: (3/2-,9/2+) (1994Uo01), $C^2S=(0.0013)$ for 3/2, (0.015) for 9/2 for 7190 level.
7237.8 23	5/2-	3	0.06	$J\pi$: (1/2-,5/2-) (1994Uo01), $C^2S=(0.0035)$ for 1/2, (0.0032) for 5/2 for 7258 level.
7268.3		<4		
7295.8 10	5/2-	3	0.05	
7308.4 9	7/2-	3	0.19	$J\pi$: 5/2- (1994Uo01), $C^2S=0.032$ for 7331 level.
7340.6 24	3/2+	2	0.02	

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$^{40}\text{Ca}(\text{pol d,p}),(\text{d,p})$ 1990Ec01,1994Uo01,1965Be14 (continued) ^{41}Ca Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	$L^{\ddagger}$	$(2J+1)S^{\ddagger}$	Comments
7365.3 14	(5/2)-	3	(0.08)	
7377.1 9	(5/2)-	3	(0.25)	$J\pi$: (5/2-,7/2-) (1994Uo01), C^2S =(0.0091) for 5/2, (0.0047) for 7/2 for 7396 level.
7392.9 19				
7417.1 15				
7437.3 11	5/2-	3	0.33	C^2S =0.050 (1994Uo01) for 7460 level.
7459.3	5/2-	3	0.01	
7487.5 6				
7508.8 17	7/2-	3	0.08	
7524.7 14	7/2-	3	0.05	
7537.9 14	(5/2)-	3	(0.29)	C^2S =0.049 (1994Uo01) for 7567 level.
7576.4 21				
7607.6 22	(9/2)+	4	(0.08)	$J\pi$: (5/2-) (1994Uo01), C^2S =(0.012) for 7636 level.
7631.3 16	(9/2)+	4	(0.19)	
7657.0 13		<3		
7678.6 20				
7706.7 10		>2		
7731.7 12		>2		
7751.0 9		2,3		L: 1<L<4.
7770.3 14		2,3		L: 1<L<4.
7817.1 11	5/2-	3	0.56	C^2S =0.021 (1994Uo01) for 7795 level.
7887.8 11	5/2-	3	0.04	C^2S =0.052 (1994Uo01) for 7851 level.
7919.1 24	(5/2)-	3	(0.08)	C^2S =0.014 (1994Uo01) for 7894 level.
7957.3	5/2-	3	0.12	C^2S =0.012 (1994Uo01).
7974.3	7/2-	3	0.03	$J\pi$: (5/2-) (1994Uo01), C^2S =(0.015) for 7995 level.
7995.3	(9/2)+	4	(0.03)	
8047.5 17	(5/2)-	3	(0.10)	
8063.4 23	7/2-	3	0.14	
8101.8 14	7/2-	3	0.02	$J\pi$: 5/2- (1994Uo01), C^2S =0.029 for 8105 level.
8120.3	5/2+	2	0.05	
8136.1 16	(5/2)-	3	(0.11)	
8150.8 9	(5/2)-	3	(0.15)	
8179.0 19	5/2+	2	0.03	
8199.7 19	7/2-	3	0.03	$J\pi$: 5/2- (1994Uo01), C^2S =0.031 for 8196 level.
8229.4 19	5/2+	2	0.05	
8242.3		<3		
8259.3				
8312.7 21	(9/2)+	4	(0.02)	
8335.7 23	(5/2)-	3	(0.14)	
8373.5 18	5/2+	2	0.04	
8402.2 21		>2		$J\pi$: 5/2- (1994Uo01) for 8397 level, C^2S =0.031.
8447.4	(9/2)+	4	(0.08)	C^2S =(0.0014) (1994Uo01) for 8458 level.
8467.4 12	7/2-	3	0.03	
8522.4 20	7/2-	3	0.08	C^2S =(0.0058) (1994Uo01).
8549.3	5/2-	3	0.15	
8585.3	7/2-	3	0.05	
8620.4	5/2-	3	0.29	C^2S =0.021 (1994Uo01).
8638.4	5/2-	3	0.33	C^2S =0.077 (1994Uo01) for 8697 level. But 8697 group in 1994Uo01 should be associated with 8700 level of 1990Ec01.
8673.3				
8700.4	5/2+	2	0.05	
8783 $\S$ 10	5/2-	3		(2J+1)S: C^2S =0.025 (1994Uo01).
8855 $\S$ 10	(9/2+)	(4)		(2J+1)S: C^2S =(0.0025) (1994Uo01).
8916 $\S$ 10	(3/2-,9/2+)	(1,4)		(2J+1)S: C^2S =(0.0006) for 9/2+, (0.0011) for 3/2- (1994Uo01).
8997 $\S$ 10	(9/2+)	(4)		(2J+1)S: C^2S =(0.0020) (1994Uo01).
9084 $\S$ 10	5/2-	3		(2J+1)S: C^2S =0.020 (1994Uo01).
9177 $\S$ 10				
9273 $\S$ 10	(5/2-,9/2+)	(3,4)		$J\pi$: (5/2 to 11/2)+ in Adopted Levels. (2J+1)S: C^2S =(0.0010) for 5/2-, (0.0006) for 9/2+ (1994Uo01).
9315 $\S$ 10				
9367 $\S$ 10				
9414 $\S$ 10				
9475 $\S$ 10				

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$^{40}\text{Ca}(\text{pol d,p}),(\text{d,p})$ 1990Ec01,1994Uo01,1965Be14 (continued) **^{41}Ca Levels (continued)**E(level)[†]

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[†] From 1990Ec01, unless otherwise stated.[‡] From comparison of $\sigma(\theta)$ and $\text{Ay}(\theta)$ data with DWBA calculations. Values are from 1990Ec01, unless otherwise stated. For comparison C^2S (where $\text{C}^2=1$) values from 1994Uo01 and 1990En08 are given under comments. In 1990En08, values represent average of results from 1965Be14, 1970Se01, 1972Ko41, 1974Br19, 1975Ha14 and 1973Se09 as summarized in 1978En02.§ Level reported by 1994Uo01 only. $\text{J}\pi$ is from comparison of $\sigma(\theta)$ and $\text{Ay}(\theta)$ data with DWBA analysis.

Direct contribution in a CCBA analysis.

@ Probable doublet (1990Ec01).

& From 1965Be14 only. This level is considered as uncertain since it is not confirmed in later studies.

 $^{40}\text{Ca}(\text{t,d})$ 1969Sa17,1972Go14,1991Pi091991Pi09: E(t)=33 MeV. Measured $\sigma(\theta)$ for g.s. DWBA analysis (FRESCO code).1972Go14: E(t)=1.7–3.5 MeV from BNL 3.5 MeV electrostatic accelerator. Reaction particles detected with two silicon surface-barrier detectors ($\Delta\text{E-E}$). Measured $\sigma(\theta)$ for g.s. DWBA analysis.1969Sa17: E(t)=20 MeV. Detected particles with solid-state-detector counter telescope $\Delta\text{E-E}$ (FWHM=35 keV). Measured $\sigma(\theta)$. DWBA analysis. **^{41}Ca Levels**

E(level) [†]	L [†]	S	Comments
0.0	3	0.80 3	S: from 1972Go14. Others: 0.8 2 (1969Sa17).
1950	1		
2020	2		

[†] From 1969Sa17. **$^{40}\text{Ca}(\alpha,2\text{pn}\gamma)$ 1974Al23**1974Al23: E(α)=51 MeV from cyclotron at Research Institute of Physics, Stockholm. Measured $\text{E}\gamma$, $\gamma\gamma$ -coin, $\gamma(\theta)$ with Ge(Li) detectors. **^{41}Ca Levels**

E(level) [†]	$\text{J}\pi^{\ddagger}$	Comments
0.0	7/2-	
3201.1 5	9/2+	
3369.9 10	11/2+	
3831.0 12	15/2+	
3915.3 12	13/2+	
5219.0 15	(13/2, 17/2)+	
6826 2		$\text{J}\pi$: (19/2) from 1974Al23.

[†] From 1974Al23.[‡] From Adopted Levels. **$\gamma(^{41}\text{Ca})$**

$\text{E}\gamma^{\dagger}$	E(level)	Mult. [‡]	$\delta^{\dagger}$	Comments
168.8 5	3369.9	D(+Q)	+0.05 +6-8	$\text{A}_2=-0.21$ 3, $\text{A}_4=-0.06$ 6.
461.1 5	3831.0	$\text{E}2^{\S}$		$\text{A}_2=+0.40$ 2, $\text{A}_4=+0.20$ 3.

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$^{40}\text{Ca}(\alpha, 2p\gamma)$ 1974Al23 (continued) $\gamma(^{41}\text{Ca})$ (continued)

$E\gamma^\dagger$	E(level)	Mult. ‡	$\delta^\dagger$	Comments
545.4 5	3915.3	D(+Q)	-0.02 +9-8	$A_2=+0.31$ 8, $A_4=+0.02$ 10.
1388.0 10	5219.0	D		$A_2=-0.23$ 8, $A_4=-0.03$ 11.
1607 2	6826			$\delta(E2/M1)=-1.8$ from tentative values of $A_2=-0.92$, $A_4=+0.29$.
3201.1 5	3201.1	D(+Q)	-0.02 +2-4	$A_2=-0.28$ 3, $A_4=+0.05$ 6.
3369.9 10	3369.9	M2+E3§	+0.34 +59-21	$A_2=+0.84$ 9, $A_4=+0.17$ 10.

 † From 1973Al23. ‡ From angular distribution.

§ From angular distribution and transition strengths calculated using halflife in Adopted Levels.

Level Scheme

$^{40}\text{Ca}(\alpha, ^3\text{He})$ 1981Fo09, 1970Yo01

1981Fo09: $E(\alpha)=36$ MeV from tandem accelerator at Orsay. Reaction products detected with the split-pole magnetic spectrograph and six position-sensitive Si detectors (FWHM= 20 keV). Measured $\sigma(\theta)$. Zero-range DWBA (chuck2 code) and coupled-channel analysis.

1972Ha08: $E(\alpha)=104$ MeV from Karlsruhe Isochronous Cyclotron. ^3He detected with $\Delta E-E$ telescopes detectors consisting of Si(Li) (FWHM=400 keV) and NaI(Tl). Measured $\sigma(\theta)$ for g.s. DWBA analysis.

1970Yo01: $E(\alpha)=40$ MeV from Texas A&M cyclotron. Reaction products detected with a $\Delta E-E$ surface barrier semiconductor telescope (FWHM=60-80 keV). Measured $\sigma(\theta)$. A total of 14 groups studied. Zero and finite-range DWBA analysis (DWUCK code).

1969Ga11: $E(\alpha)=56$ MeV from synchrocyclotron at University of Lyon. Measured $\sigma(\theta)$. DWBA analysis.

Cross section data from 1981Fo09 at 10° (lab)			
Level	$d\sigma/d\Omega$ (mb/sr)	Level	$d\sigma/d\Omega$ (mb/sr)
0	15.8	4094	0.025
1943	0.101	4278	0.021
2010	0.158	4332	0.009
2462	0.029	4449	0.101
2575	0.014	4519	0.018
2605	0.023	4728	0.029
2670	0.014	4814	0.016
2883	0.141	4972	0.308
2959	0.034	5194	0.153
3049	0.009	5218	0.042
3201	0.487	5283	0.011
3369	0.086	5411	0.018
3400	0.029	5646	0.048
3525	0.065	5682	0.017
3613	0.035	5740	0.111
3676	0.009	5796	0.025
3740	0.058	5915	0.031

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$^{40}\text{Ca}(\alpha, ^3\text{He})$ 1981Fo09,1970Yo01 (continued)

3830	0.018	6067	0.119
3915	0.062	6480	0.022
3944	0.008	6900	0.029
3975	0.020	6980	0.045
4015	0.016	7110	0.033

 ^{41}Ca Levels

E(level) [†]	L [†]	S [‡]	Comments
0.0	3	1	(2J+1)S=10.3, 8.0 (1970Yo01).
1943 5	1	0.66	(2J+1)S=2.24, 0.26 (1970Yo01).
2010 5	2	0.21	
2462 5	1	0.26	(2J+1)S=0.60, 0.09 (1970Yo01).
2575 5	3	0.005	
2605 5			
2670 5			
2883 5	4	0.03	(2J+1)S=0.12, 0.09 (1970Yo01).
2959 5	(3)	0.008	
3049 5			
3201 5	(4)	0.02	L: 3 (1970Yo01). (2J+1)S=0.54, 0.36 (1970Yo01).
3369 5			
3400 5	(0)		L: from 1970Yo01 for a 3379 group. (2J+1)S=0.02 (1970Yo01).
3525 5			
3613 [§] 5	(1)		L: from 1970Yo01 for a 3600 group. (2J+1)S=0.5 (1970Yo01).
3676 5			
3740 5	2	0.07	
3830 5			
3915 5			
3944 5	1	0.82	(2J+1)S=1.96, 0.23 (1970Yo01).
3975 [§] 5			
4015 5			
4094 5			
4278 5			
4332 [§] 5			
4449 5	(4)	0.02	L: (3,4) in 1970Yo01. (2J+1)S=0.17, 0.14 (1970Yo01).
4519 5			
4615 5			
4728 [§] 5			
4814 5			
4878 5	3	0.13	
4972 5	(4)	0.06	(2J+1)S=1.15, 0.87 (1970Yo01).
5040 5			
5194 5	(4)	0.04	(2J+1)S=0.73, 0.59 (1970Yo01).
5218 5			
5283 5			
5411 5			
5646 5	3	0.27	
5682 5	3	0.08	
5740 5	(4)	0.03	L: (3,4) in 1970Yo01 for a 5755 group. (2J+1)S=0.89, 0.69 (1970Yo01).
5796 5	3	0.14	
5915 5			
6067 5	(3)		L: from 1970Yo01 for a 6082 group. (2J+1)S=1.26 (1970Yo01).
6480 10			
6900 10	(3)	0.12	
6980 10	(4)	0.02	
7110 10			

[†] From 1981Fo09.

$^{40}\text{Ca}(\alpha, ^3\text{He})$ 1981Fo09,1970Yo01 (continued) **^{41}Ca Levels (continued)**

‡ Relative spectroscopic factors (1981Fo09). (2J+1)S given by 1970Yo01 for two different sets of parameters are given under comments; the second set is normalized to S=1.0 for g.s. as in 1981Fo09.

§ Unresolved doublet.

 $^{40}\text{Ca}(^7\text{Li}, ^6\text{Li})$ 1986Sa19,1984Ec01

1986Sa19: E(^7Li)=34 MeV from FSU Super Tandem Van de Graaff accelerator. Reaction products detected with an array of three E-ΔE silicon surface-barrier detector telescopes. Measured $\sigma(\theta)$. Finite range DWBA analysis (DAISY code).

1984Ec01: E(^7Li)=45 MeV from ANU 14UD tandem accelerator. Reaction products detected with ENGE split-pole magnetic spectrograph and focal-plane detector. Measured $\sigma(\theta)$. DWBA analysis (DAISY code).

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	C^2S	Comments
0.0	7/2-	0.94	C^2S : 0.81 (1984Ec01).
1940	3/2-	0.57	C^2S : 0.63 (1984Ec01).
2460	3/2-	0.20	C^2S : 0.21 (1984Ec01).
3940	1/2-	0.65	

† From Adopted Levels.

 $^{40}\text{Ca}(^9\text{Be}, ^8\text{Be})$ 1977La11,1977St20

1977La11 (also 1978Un02): E(^9Be)=20 MeV from tandem Van de Graaff accelerator at Nuclear Physics Laboratory. ETH Zurich. Detected α - α coincidence from ^8Be decay using silicon surface barrier detectors. Measured $\sigma(\theta)$ from 20°-70°. DWBA analysis (MARS-SATURN code).

1977St20: E(^9Be)=50 MeV from LBNL 88 inch cyclotron. Detected α - particles from ^8Be decay using surface barrier silicon position sensitive detectors (FWHM=450 keV). Measured $\sigma(\theta)$. DWBA analysis (PTOLEMY code).

 ^{41}Ca Levels

E(level)‡	$J\pi^\dagger$	L#	$S^\ddagger$	Comments
0.0	7/2-	2,3,4	0.71 10	S: 0.21 (1977St20).
1940	3/2-	0,1,2	0.79 10	S: 0.20 (1977St20).
2460	3/2-	0,1,2	0.26 4	S: 0.08 (1977St20).
3400	1/2+		0.090 10	
3940	1/2-	1,2	0.71 8	E(level): from 1977St20. E=3890 (1977La11). S: 0.18 (1977St20).
4740	1/2-	1,2	0.33 6	S: 0.10 (1977St20).
5290	5/2+		0.11 2	
5640	(5/2)-		0.76 14	E(level): possibly a doublet.
7500§				
8600§				

† From Adopted Levels.

‡ From 1977La11, unless otherwise stated.

§ From 1977St20 only.

From 1977St20.

$^{40}\text{Ca}(^{11}\text{B}, ^{10}\text{B})$ 1980G107

1980G107: $E(^{11}\text{B})=51.5$ MeV from FSU FN tandem Vande Graaf accelerator. Reaction products detected with Si surface barrier counter telescopes. Measured $\sigma(\theta)$. DWBA analysis.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	C ² S
0.0	7/2-	0.83

[†] From Adopted Levels.

 $^{40}\text{Ca}(^{12}\text{C}, ^{11}\text{C})$ 1989Wi07,1972Sc21

1989Wi07: $E(^{12}\text{C})=604.8$ MeV from NSCL. Reaction products detected with proportional counters. Measured $\sigma(\theta)$, deduced spectroscopic factor.

1972Sc21: $E(^{12}\text{C})=114$ MeV from Harwell Atomic Energy Research Establishment cyclotron. Particle detected with telescope semiconductor detector. Measured spectra.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	C ² S	Comments
0.0	7/2-	0.83	C ² S: from 1989Wi07.

[†] From Adopted Levels.

 $^{40}\text{Ca}(^{13}\text{C}, ^{12}\text{C})$ 1980Du03

1980Du03: $E(^{13}\text{C})=18.5, 19.0$ MeV from EN tandem Van de Graaf, University of Oxford. Charged particles detected with silicon detectors. Measured $\sigma(\theta)$. DWBA analysis (DAISY code).

1973Bo45: $E(^{13}\text{C})=40-68$ MeV from BNL MP tandem Van de Graaff. Outgoing particles detected with two counter telescopes (FWHM= 300 keV). Measured $\sigma(\theta)$ for g.s. DWBA analysis.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	C ² S [‡]
0.0	7/2-	0.90 5
1940	3/2-	0.69 4
2460	3/2-	0.23 2

[†] From Adopted Levels.

[‡] From 1980Du03.

 $^{40}\text{Ca}(^{14}\text{C}, ^{13}\text{C})$ 1985Vi01,1981Ha23

1985Vi01: $E(^{14}\text{C})=64$ MeV from Los Alamos tandem electrostatic accelerator. Scattered ions detected with long gridded ionization counter (FWHM= 140 keV). Measured $\sigma(\theta)$. DWBA analysis (codes Ptolemy and ONEFF/DIWRI).

1981Ha23 (same group as 1985Vi01): $E(^{14}\text{C})=51$ MeV from Los Alamos tandem electrostatic accelerator. Scattered ions detected with long gridded ionization (FWHM=60- 100 keV). DWBA analysis (code DWIS).

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	L [‡]	C ² S [§]	Comments
0.0	7/2-	4+3	0.67	L: L=4 dominates DWBA (1981Ha23). C ² S: 0.74 (1981Ha23).

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(^{14}\text{C}, ^{13}\text{C})$ 1985Vi01,1981Ha23 (continued) ^{41}Ca Levels (continued)

E(level)	$J\pi^\dagger$	$L^\ddagger$	$C^2S^\S$	Comments
1940	3/2-	2+1	0.41 [#]	L: L=2 dominates DWBA (1981Ha23). C ² S: 0.52 (1981Ha23).
2460	3/2-	2+1	0.14 [@]	L: L=2 dominates DWBA (1981Ha23). C ² S: 0.15 (1981Ha23).

[†] From Adopted Levels.[‡] From DWBA analysis (1985Vi01,1981Ha23).[§] For assumed $S(^{14}\text{C}) = 1.73$ (1985Vi01), 1.95 (1981Ha23).[#] Contribution from 2010, 3/2+ level considered to be negligible (1985Vi05).[@] Contributions from 2575, 3/2- and 2605, 5/2+ levels considered to be negligible (1985Vi05). **$^{40}\text{Ca}(^{14}\text{N}, ^{13}\text{N})$ 1966Co27**

1966Co27: $E(^{14}\text{N}) = 25.6\text{--}29.5$ MeV from Oak Ridge tandem Van de Graaff accelerator. Particles collected on foils in the scattering chamber were detected with NaI detectors (FWHM=10 keV). Measured $\sigma(\theta)$ and excitation functions. DWBA analysis.

 ^{41}Ca Levels

E(level) [†]
0.0
1940

[†] Excitation of g.s. and first excited state is indicated in ^{13}N particles detected in foils. **$^{40}\text{Ca}(^{17}\text{O}, ^{16}\text{O})$ 1974Jo09**

1974Jo09: $E(^{17}\text{O}) = 28.5$ MeV from Liverpool Tandem Electrostatic Generator. Reaction particles detected with four solid state detectors. Measured $\sigma(\theta)$. DWBA analysis.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	S
0.0	7/2-	
1950	3/2-	0.76
2020	3/2+	0.20
2470	3/2-	0.24
3940	1/2-	

[†] From Adopted Levels.

$^{40}\text{Ca}(^{18}\text{O},^{17}\text{O})$ 1977Pe08,1982Re14

1982Re14: $E(^{18}\text{O})=62.14$ MeV from Argonne National Laboratory FN tandem. Reaction products detected with position-sensitive chamber. Measured $\sigma(\theta)$, DWBA analysis (code PTOLEMY).

1977Pe08: $E(^{18}\text{O})=50$ MeV from University of Minnesota MP tandem Van de Graaf accelerator. Reaction products detected with position-sensitive solid state detector (FWHM=100 keV). Measured $\sigma(\theta)$ from 20° – $80^\circ(\text{c.m.})$. DWBA analysis.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	$S^\ddagger$	Comments
0.0	7/2–	2.32	S: Other: 1.22 (1977Pe08) $C^2S=0.20$ (1977Pe08).
1940	3/2–	1.14	S: Other: 1.00 (1977Pe08).
2460	3/2–	0.32	S: 0.26 (1977Pe08).
2870	7/2+		
3940	1/2–	0.73	S: Other: 0.65 (1977Pe08).

† From Adopted Levels.

‡ C^2S .

$§$ From 1982Re14.

 $^{40}\text{Ca}(^{28}\text{Si},^{27}\text{Si})$ 1986Vi02

1986Vi02: $E(^{28}\text{Si})=225$ MeV from Argonne superconducting linac. Reaction products detected with position-sensitive chamber (FWHM= 400 keV). Measured $\sigma(\theta)$, DWBA analysis (code PTOLEMY).

 ^{41}Ca Levels

E(level)	C^2S	Comments
0.0	2.7 4	C^2S : 0.60 11 for excitation to 780, 1/2+ level in ^{27}Si ; 0.55 10 for excitation to 960, 3/2+ level in ^{27}Si .

 $^{40}\text{Ca}(^{32}\text{S},^{31}\text{S})$ 1989Di06

1989Di06: $E(^{32}\text{S})=90, 110$ MeV from MP tandem, Strasbourg. Reaction products detected with two position-sensitive detectors. Measured $\sigma(\theta)$, DWBA analysis.

 ^{41}Ca Levels

E(level)

0.0

 $^{41}\text{K}(\text{p},\text{n}\gamma)$ 1970Jo03,1971La08

1970Jo03: $E(\text{p})=3.33$ – 4.33 MeV from Orsay 4 MV Van de Graaff accelerator. Measured E_γ and γ branching. Gammas detected with a Ge(Li) detector and their branchings deduced with a NaI(Tl) detector.

1971La08 (same group as 1970Jo03): $E(\text{p})=3.24$ – 5.18 MeV. Measured lifetimes by Doppler-shift attenuation method.

1970Ho26: $E(\text{p})=4.5$ MeV. γ rays detected with Ge(Li). Measured lifetimes by $\text{p}\gamma(\text{t})$ and pulsed beam technique.

1967Si11: $E(\text{p})$ with energies slightly above $E_{\text{thresh}} = 1.2$ MeV. γ -rays measured with Ge(Li) detectors. Measured lifetimes of 1944 and 2467 levels by Doppler-shift attenuation method.

 ^{41}Ca Levels

E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$	Comments
0.0	7/2–		
1944 5	3/2–	0.28 ps 9	$T_{1/2}$: From 1971La08. Other: 0.31 ps +17–7 (1967Si11).
2011 5	3/2+	0.56 ns 14	$T_{1/2}$: from $\text{p}\gamma(\text{t})$ and pulsed beam technique (1970Ho26).
2467 5	3/2–	>0.5 ps	$T_{1/2}$: From DSAM method (1967Si11).

Continued on next page (footnotes at end of table)

$^{41}\text{K}(\text{p},\text{n}\gamma)$ 1970Jo03,1971La08 (continued) ^{41}Ca Levels (continued)

E(level)	$J\pi^\dagger$	$T_{1/2}^\ddagger$
2578 5	5/2-	66 fs 21
2605 5	5/2+	111 fs 35
2673 5	1/2+	0.28 ps +29-18
2882 5	7/2+	≤ 14 fs
2957 5	7/2-	≤ 28 fs
3200§	9/2+	19 fs 17
3614§	7/2+	15 fs 9
3730§	3/2-	38 fs 14

 † From Adopted Levels. ‡ From DSAM (1971La08), except when stated otherwise.

§ From 1971La08.

 $\gamma(^{41}\text{Ca})$

E(level)	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	Comments
1944	1944 5	100	E_γ : 1948 (1970Ho26).
2011	67§	<5	E_γ, I_γ : From 1970Ho26. This γ -ray was not observed but an upper limit of 5% was set.
	2011 5	100	
2467	456§	≤ 0.5	
	523 5	100	
	2467§	≤ 0.3	
2578	567§	≤ 1	
	634§	≤ 1	
	2578 5	100	
2605	594§	≤ 8	
	661§	≤ 5	
	2605 5	100	
2673	662 5	30	
	731 5	70	
	2673§	≤ 4	
2882	871§	≤ 1	
	938§	≤ 1	
	2882 5		
2957	946§	≤ 10	
	1013§	≤ 10	
	2957 5	100	
3200	3200		
3614	3614		
3730	3730		

 † From level-energy differences. Uncertain gammas except as noted were extracted by the evaluators from the level scheme in Fig.4 (1970Jo03), do not appear in Table 2 (1970Jo03) nor in Fig.2 (1970Jo03). ‡ From 1970Jo03.

§ Placement of transition in the level scheme is uncertain.

⁴¹K(p,n γ) 1970Jo03,1971La08 (continued)

Level Scheme

Intensities: % photon branching from each level

⁴¹K(³He,t) 2004Fu08,1975Gr14

J π (⁴¹K g.s.)=3/2+.

2004Fu08: E(³He)=140 MeV/nucleon from cyclotron at RCNP, Osaka. Tritons were analyzed with a magnetic spectrometer and detected with a multiwire drift-chamber system (FWHM=35 keV). Spectra measured at 0°-0.5°, 0.5°-1.0° and 1.0°-1.5° ranges. Deduced yields for individual peaks. Derived GT strengths. Possible analog states between ⁴¹Ca and ⁴¹Sc below 6.2 MeV where main part of GT strength are concentrated were made by comparison of the B(GT) values and in the (³He,t) and ⁴¹Ti β decay to ⁴¹Sc (1997Ho12).

1975Gr14: E(³He)=25 MeV from Argonne National Laboratory FN tandem Van de Graaf accelerator. Reaction products detected with photographic emulsions and position sensitive proportional counter. Measured triton spectrum and $\sigma(\theta)$. Determined L from DWBA analysis (DWUCK code).

1970Sc03: E(³He)=23 MeV from Stanford University FN Tandem Van de Graaff. Detected tritons with E- Δ E telescope detectors (FWHM=60 keV) from 10°- 35°. Measured σ . Strong peaks at g.s., 2020, 2890, 4111, 4360, 4980, 5300 and 5830.

1975Ta05: E(³He)=18 MeV from University of Pennsylvania tandem accelerator. Strong group seen at 5814.

⁴¹Ca Levels

E(level) [‡]	J π ^d	L [†]	B(GT) ^b	Comments
0.0 [§]		3+5 [#]		
2012 5	3/2+	0	0.031 3	E(level): E=2005 9 with L=2 (1975Gr14). E(level): possible analog state of 2096 level in ⁴¹ Sc.
2607 5	5/2+	0	0.020 3	E(level): possible analog state of 2667 level in ⁴¹ Sc.
2676 5	1/2+	(0)	0.003 1	E(level): possible analog state of 2719 level in ⁴¹ Sc.
2884 5	7/2+	≥ 1		E(level): E=2875 12 with L=2 (1975Gr14). J π : From 1975Gr14. A preference of 7/2+ over 9/2+ is shown by the authors (1975Gr14), since S=0 state are expected to be populated more strongly than S=1 states in (³ He,t).
3050 5	3/2+	0	0.004 1	
3400 5	1/2+	0	0.067 6	E(level): E=3394 12 with L=2 (1975Gr14). E(level): possible analog state of 3412 level in ⁴¹ Sc.
3526 5	3/2+	0	0.034 4	E(level): E=3510 12 with L=2 (1975Gr14). E(level): possible analog state of 3563 level in ⁴¹ Sc.
3737 5	(3/2, 5/2)+	0	0.030 3	E(level): E=3754 12 with L=2 (1975Gr14). E(level): possible analog state of 3781 level in ⁴¹ Sc.
3845 5	1/2+	0	0.012 2	E(level): E=3874 10 with L=(3) (1975Gr14). E(level): possible analog state of 3969 level in ⁴¹ Sc.
3992 [§] 10				
4093 5	5/2+	0	0.45 3	E(level): E=4098 8 with L=2 (1975Gr14). E(level): Strongest peak known to have pure GT nature. E(level): possible analog state of 4245 level in ⁴¹ Sc.

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$^{41}\text{K}(^3\text{He},t)$ 2004Fu08,1975Gr14 (continued) ^{41}Ca Levels (continued)

E(level) [‡]	$J\pi^d$	$L^\dagger$	B(GT) ^b	Comments
4182 5	(3/2, 5/2)+	0	0.034 4	E(level): possible analog state of 4328 level in ^{41}Sc .
4330 5		≥ 1		E(level): E=4335 9 with L=3 (1975Gr14).
4419 5	3/2+	0	0.033 4	E(level): E=4426 8 with L=2 (1975Gr14).
				E(level): possible analog state of 4502 level in ^{41}Sc .
4550 5		0	0.014 2	E(level): E=4551 11 with L=(2) (1975Gr14).
				E(level): possible analog state of 4644 level in ^{41}Sc .
4727@ 5	(3/2)+, (5/2)+	0	0.220 17	E(level): E=4738 13 with L=2 (1975Gr14).
				E(level): possible analog state of 4869 level in ^{41}Sc .
4777@ 5	(3/2)+	0	0.033 5	E(level): possible analog state of 4777 level in ^{41}Sc .
4815@ 5	5/2+	0	0.149 12	E(level): possible analog state of 4929 level in ^{41}Sc .
4966 5		0	0.021 3	E(level): possible analog state of 5023 level in ^{41}Sc .
4986§ 8		3#		
5097 5	3/2+	0	0.011 2	E(level): E=5090 15 with L=2,3 (1975Gr14).
				E(level): possible analog state of 5084 level in ^{41}Sc .
5202§ 10		5+6#		
5283? 5	5/2+		0.059 17	E(level): E=5295 7 with L=2,3 (1975Gr14).
				E(level): possible analog state of 5374 level in ^{41}Sc .
5406 5	e	(0)	0.045 10	E(level): E=5417 7 with L=2,3 (1975Gr14).
5480 5	(3/2)+	0	0.079 7	E(level): E=5493 10 with L=(2) (1975Gr14).
				E(level): possible analog state of 5576 level in ^{41}Sc .
5631§ 8		2#		
5652& 5	f	0	0.067 6	
5717& 5	f	0	0.190 15	E(level): E=5715 10 with L=2 (1975Gr14).
5756& 5	(5/2)+	0	0.051 6	E(level): possible analog state of 5885 level in ^{41}Sc .
5814& 5	3/2+	0	0.148 25	E(level): E=5822 10 with L=0 (1975Gr14).
				E(level): Isobaric analog state (IAS) (2004Fu28).
				E(level): Analog of ^{41}K g.s. (1975Gr14,1975Ta05).
				E(level): possible analog state of 5941 level in ^{41}Sc .
5890 ^a 5	f	(0)	0.021 4	
5969 ^a 5	(3/2, 5/2)+	0	0.192 15	E(level): E=5963 8 with L=2 (1975Gr14).
				E(level): possible analog state of 6085 level in ^{41}Sc .
6019 ^a 5		(0)	0.018 4	E(level): possible analog state of 6133 level in ^{41}Sc .
6068§ 8				
6326 5		0	0.031 3	E(level): E=6315 9 with L=2,3 (1975Gr14).
6464 5		0	0.030 3	E(level): E=6470 8 with L=2,3 (1975Gr14).
6544 5		≥ 1		E(level): E=6565 9 with L=2 (1975Gr14).
6596 5		0	0.033 3	
6653 5		≥ 1		E(level): E=6650 9 with L=2,3 (1975Gr14).
6744 5		≥ 1		E(level): E=6743 8 with L=2,3 (1975Gr14).
6823 5		≥ 1		E(level): E=6829 7 with L=2,3 (1975Gr14).
6904 5		0	0.007 1	E(level): E=6905 11 (1975Gr14).
6959 5		≥ 1	c	
6984 5		0	0.013 ^c 2	E(level): E=6991 9 with L=(2,3) (1975Gr14).
7120§ 11		3+5#		
7207§ 14		2+3#		
7225 5		0	0.018 2	
7296 5	f	0	0.024 3	
7332 5		0	0.026 3	
7370 20		≥ 1		
7499 8		2		
7552 5		≥ 1		E(level): E=7553 8 with L=2 (1975Gr14).
7586 5		≥ 1		
7614§ 8				
7639 5		0	0.006 2	
7720 20		≥ 1		
7792 5		(0)	0.006 2	
7854 5		0	0.018 3	
7901 5		≥ 1		
7986 5		0	0.010 4	
8046 7		0	0.002 1	
8144 7		0	0.008 2	
8272 7		(≥ 1)		
8347 7		≥ 1		

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⁴¹K(³He,t) 2004Fu08,1975Gr14 (continued)

⁴¹Ca Levels (continued)

E(level) [‡]	L [†]	B(GT) ^b	E(level) [‡]	L [†]	B(GT) ^b	E(level) [‡]	L [†]	B(GT) ^b
8406 7	(0)	0.009 2	9183 7	≥1		10030 20	≥1	
8468 7	≥1		9230 7	(0)	0.006 2	10113 7	(0)	0.009 3
8515 7	≥1		9324 7	(≥1)		10161 7	(0)	0.013 3
8587 7	0	0.016 3	9400 20	≥1		10194 7	≥1	
8653 7	≥1		9590 7	(0)	0.019 4	10238 7	≥1	
8702 7	≥1		9616 7	≥1		10286 7	0	0.023 4
8861 7	0	0.011 3	9669 7	0	0.014 3	10339 7	≥1	
8926 7	0	0.009 2	9771 7	≥1		10421 7	0	0.014 3
9013 7	0	0.016 3	9862 7	(0)	0.004 2			
9081 7	≥1		9928 7	≥1				

[†] Except as noted, deduced from σ(θ) with angle cuts at 0°-0.5°, 0.5°-1.0° and 1.0°-1.5°. The L=0 GT states peak at 0°. The yields at 0° for most states were compared with that for the 4093 state, known as pure L=0, GT state.

[‡] From 2004Fu08 except as noted.

[§] From 1975Gr14.

[#] From 1975Gr14.

@ Cluster of states at E= 4.75 MeV that were difficult to identify (2004Fu28).

& Cluster of states at E= 5.7 MeV that were difficult to identify (2004Fu28).

a Cluster of states at E= 5.95 MeV that were difficult to identify (2004Fu28).

b Gamow-Teller (GT) transition strengths, extracted from cross sections at 0° in 2004Fu28.

c Combined value of 0.013 2 for 6959+6984.

d From 2004Fu28. For L(³He,t)=0 from 3/2+ target and ΔJπ=1+ GT transition, expected Jπ=1/2+,3/2+,5/2+. The authors (2004Fu28) deduced most probable Jπ by comparison with GT strengths of the analog states in ⁴¹Sc studied in the β decay of ⁴¹Ti (1997Ho12 and 1998Li46). The evaluators have added Jπ comments in footnotes for cases where they are in disagreement.

e 5/2+ given in 2004Fu28 who suggest the possible analog state at ⁴¹Sc at 5493 which is in disagreement with the Jπ(⁴¹Sc) of 1/2+.

f π=+ from L=0 in 2004Fu28 at E=5.652, 5.717, 5.890, 7.296 MeV are in disagreement with the negative parity of the suggested analog states in ⁴¹Sc respectively, at E=5.773, 5.836, 6.036 and 7.296 MeV.

⁴¹Ca(e,e) 1990Ba42,1988Pl02

1990Ba42 (also 1991Ba33): E(e)=85-190 MeV from MIT-bates Linear Accelerator Center. Measured σ(θ), deduced form factor.

1988Pl02: E(e)=175-320, 500 MeV from Saclay linear electron accelerator. Measured σ(θ), deduced form factor.

⁴¹Ca Levels

E(level)	Jπ	Comments
0.0	7/2-	f7/2 neutron-orbit rms radius= 3.96 fm 5 (1990Ba42), 3.95 fm 6 (1988Pl02).

⁴¹Ca(p,p') 1977Vo09

1977Vo09: E(p)=19 MeV from University of Rochester MP tandem Van de Graaff accelerator. Scattered particles detected using position sensitive solid state detectors (FWHM=12 keV), and photographic emulsions. Measured σ(θ). FWHM=25 keV. Determined levels, angular momentum transfers and transition strengths using DWBA and coupled-channel analysis (DWUCK code).

Cross section data					
Level	dσ/dΩ	θ(°)	Level	dσ/dΩ	θ(°)
	μb/sr (max)			μb/sr	(max)
1942	625	30	5093	79	60
2009	45	45	5119	93	45
2460	130	30	5142	98	67.5
2573	114	30	5158	88	60
2604	187	30	5194	97	37.5
2668	34	37	5218	206	37.5
2882	400	30	5281	117	37.5

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$^{41}\text{Ca}(\text{p,p}') \quad 1977\text{Vo09 (continued)}$

2958	127	30	5306	88	60
3049	46	45	5337	184	37.5
3201	664	30	5364	56	45
3369	1186	52	5408	79	37.5
3399	105	52	5467	34	67.5
3496	8	45	5479	63	52.5
3525	212	45	5501	67	52.5
3613	315	52	5518	72	67.5
3676	216	30	5537	140	60
3730	222	52	5581	55	60
3828	501	30	5635		
3914	684	45	5646	60	37.5
3942	114	37	5682	157	45
3973	356	37	5716	54	45
4014	289	37.5	5746	101	37.5
4093	178	37.5	5762	80	60
4184	17	67.5	5796	80	60
4279	111	45	5814	54	60
4327	287	45	5845	60	60
4340	58	60	5862	73	60
4414	45	60	5884	51	60
4446	196	45	5927	152	52.5
4520	282	45	5970	56	60
4551	25	67.5	5980	54	52.5
4569	90	52.5	6007	90	52.5
4599	66	37.5	6029	74	37.5
4731	183	37.5	6057	474	37.5
4752	60	60.0	6071	143	60
4778	61	67.5	6091	69	37.5
4813	83	52.5	6160	54	60
4830	53	45	6176	31	60
4877	72	45	6197	25	60
4928	63	60	6232	52	60
4969	309	37.5	6245	39	52.5
4993	122	37.5	6305	109	45
5010	<29	52.5	6320	96	45
5046	95	52.5	6360	≤111	37.5
5062	63	60			

 ^{41}Ca Levels

E(level)	L	B(EL) [†]	Comments
0.0			
1942 5	(2)	28×10^{-4}	
2009 5	3,5	$1.6 \times 10^{-4} \$$	
2460 5	2+4	$2.9 \times 10^{-4} @$	B(EL): 0.34×10^{-4} for B(E4).
2573 5	2+4	$2.1 \times 10^{-4} @$	B(EL): 0.41×10^{-4} for B(E4).
2604 5	3,5		
2668 5	[3]	1×10^{-4}	
2882 5	3	1.3×10^{-4}	
2958 5	2+4	$2.3 \times 10^{-4} @$	B(EL): 0.39×10^{-4} for B(E4).
3049 5	3,4,5	$1.6 \times 10^{-4} \$$	
3201 5	3	22×10^{-4}	
3369 5	3	39×10^{-4}	
3399 5	(3)	3.5×10^{-4}	
3496 5			
3525 5	(3)	7.2×10^{-4}	
3613 5	(3)	9.8×10^{-4}	
3676 5	2	9.1×10^{-4}	
3730 5	(3,5)	$8.2 \times 10^{-4} \$$	
3828 5	(3,5)	$1.12 \times 10^{-4} \#$	
3914 5	(3)	21×10^{-4}	
3942 5	2+4	$4.3 \times 10^{-4} @$	B(EL): 0.46×10^{-4} for B(E4).
3973 5	(3,5)	$1.14 \times 10^{-4} \#$	
4014 5	2	19×10^{-4}	

Continued on next page (footnotes at end of table)

$^{41}\text{Ca}(\text{p},\text{p}')$ 1977Vo09 (continued) ^{41}Ca Levels (continued)

E(level)	L	B(EL) [†]	Comments
4093 5	(3)	4.4×10^{-4}	
4184 5			
4279 5	2	8.6×10^{-4}	
4327 5	3, 5	$8.9 \times 10^{-4}\$$	
4340 5			
4414 5			
4446 5	3	5.8×10^{-4}	
4520 5	(3, 5)	$8.2 \times 10^{-5}\$$	B(EL): 0.85×10^{-4} for B(E5).
4551 5			
4569 5			
4599 5			
4731 5	[3]	4.4×10^{-4}	
4752 5	[2]	5.0×10^{-4}	
4778 5			
4813 5	[3]	2.0×10^{-4}	
4830 5			
4877 5	(2)	6.4×10^{-4}	
4928 5			
4969 5	(3, 5)	$8.1 \times 10^{-4}\$$	
4993 5			
5010 5			
5046 5	[3]	2.5×10^{-4}	
5062 [‡] 5			
5093 5			
5119 5			
5142 5			
5158 5			
5194 5			
5218 5	(3, 5)	$0.76 \times 10^{-4}\#$	
5281 5	[3]	3.1×10^{-4}	
5306 5			
5337 5	(3, 5)	$6.0 \times 10^{-5}\$$	
5364 5			
5408 [‡] 5			
5467 5			
5479 5			
5501 5			
5518 5			
5537 5	(3, 5)	$4.5 \times 10^{-4}\$$	B(EL): 0.50×10^{-4} for B(E5).
5581 5			
5635 5			
5646 [‡] 5			
5682 [‡] 5	(3, 5)	$5.0 \times 10^{-4}\$$	B(EL): 0.53×10^{-4} for B(E5).
5716 5			
5746 5			
5762 5			
5796 5			
5814 5			
5845 5			
5862 5			
5884 5			
5927 5	(3, 5)	$4.4 \times 10^{-4}\$$	B(EL): 0.50×10^{-4} for B(E5).
5970 5			
5980 5			
6007 5			
6029 5			
6057 5	[3]	15×10^{-4}	
6071 5			
6091 5			
6160 5			
6176 5			
6197 [‡] 5			
6232 5			

Continued on next page (footnotes at end of table)

$^{41}\text{Ca}(\text{p},\text{p}')$ 1977Vo09 (continued) **^{41}Ca Levels (continued)**

E(level)

6245 5
 6305 5
 6320 5
 6360 5

† Isoscalar transition strengths, experimental uncertainty is 20%.

‡ Probable doublet.

§ For E3.

For E5.

@ For E2.

 $^{41}\text{Ca}(\alpha,\alpha')$ 1974De42 $J\pi(^{41}\text{Ca g.s.})=7/2^-$.

1974De42: E(α)=24 MeV from University of Rochester MP tandem Van de Graaff accelerator. Scattered particles detected using long position sensitive proportional (FWHM=25 keV), and silicon detectors as well as photographic emulsions (FWHM = 17 keV). Measured $\sigma(\theta)$. FWHM=25 keV. Determined levels, angular momentum transfers and transition strengths using DWBA and coupled-channel analysis (CHUCK code).

 ^{41}Ca Levels

E(level)	L	B(EL) [†]	E(level)	L	B(EL) [†]	E(level)	L	B(EL) [†]
0.0			4013 5	2	35×10^{-4}	5188? 5		
1944 5	2	30×10^{-4}	4094 5	3	4.7×10^{-4}	5220 5	5	0.63×10^{-4}
2460 5	[2]	$\leq 15 \times 10^{-4}$	4180? 5	[2]	$\leq 20 \times 10^{-4}$	5285 5	3	5.6×10^{-4}
2575 5	(2)	14×10^{-4}	4276? 5			5335 5	3	5.3×10^{-4}
2609 5	(3+5)		4329 5	(3)	4.3×10^{-4}	5540 [‡] 5		
2884 5	3	12×10^{-4}	4343 5	(3)	2.8×10^{-4}	5630 [‡] 5		
2960? 5	[2]	$\leq 15 \times 10^{-4}$	4420 [‡] 5			5650 [‡] 5	[2]	$< 41 \times 10^{-4} \text{ §}$
3201 5	3	20×10^{-4}	4451 5	3	7.5×10^{-4}	5670 [‡] 5	[2]	$< 41 \times 10^{-4} \text{ §}$
3370 5	3	36×10^{-4}	4520 [‡] 5			5790 [‡] 5	[2]	$< 41 \times 10^{-4} \text{ §}$
3400 5	(3)	5.0×10^{-4}	4737 5	3	7.8×10^{-4}	5850 [‡] 5		
3527 5	3	7.8×10^{-4}	4797 5	(3)	6.5×10^{-4}	5930 [‡] 5		
3614 5	3	9.3×10^{-4}	4880 [‡] 5	[2]	$< 41 \times 10^{-4} \text{ §}$	6000 [‡] 5		
3676? 5			4974 5	3	12×10^{-4}	6064 5	3	25×10^{-4}
3728 5	(3)	9.3×10^{-4}	5000? 5			6090 [‡] 5		
3829 5	5	0.86×10^{-4}	5020 [‡] 5			6410 [‡] 5		
3915 5	3	18×10^{-4}	5050 [‡] 5			6500 [‡] 5		
3944 5	[2]	$\leq 20 \times 10^{-4}$	5110 [‡] 5			6530 [‡] 5		
3973 5	5	0.56×10^{-4}	5150 [‡] 5			6560 [‡] 5		

† Isoscalar transition strengths, experimental uncertainty=15%.

‡ From Figure 2 of 1974De42, uncertainty is assumed to be 5 keV as for the other levels.

§ Estimated value for assumed L=2.

$^{42}\text{Ca}(\text{p},\text{d})$ 1972Ma23,1968Sm05

1972Ma23: E(p)=40 MeV from Grenoble cyclotron. Deuterons detected with ΔE -E silicon counter telescope with FWHM= 120 keV. Measured $\sigma(\theta)$ from 10° - 60° . Extracted spectroscopic factors and angular momentum transfer from DWBA analysis code DWUCK.

1968Sm05: E(p)=26.5 MeV from University of Colorado cyclotron. Scattered particles detected with ΔE -E telescope of surface barrier detectors. Measured $\sigma(\theta)$ from 21° - 76° . Extracted spectroscopic factors and angular momentum transfer from DWBA analysis code JULIE.

Cross section data from 1968Sm05			
Level	$\text{d}\sigma/\text{d}\Omega$ (mb/sr)	Level	$\text{d}\sigma/\text{d}\Omega$ (mb/sr)
	(max)		(max)
0	2.82	4105	0.364
2017	2.30	4829	0.081
2471	0.049	5490	0.058
2680	0.860	5840	0.626
2980	0.153	5900	0.106
3408	0.088	6040	0.097
3520	0.202	6680	0.064
3740	0.180	6820	0.139
3859	0.158	7130	0.123
3950	0.058	7410	0.104

 ^{41}Ca Levels

E(level) [†]	L [†]	C ² S [†]	Comments
0.0	3	1.47 [#]	E(level): Analog to the g.s. in ^{41}K (1972Ma23). C ² S: 1.6 (1968Sm05).
1943 [‡]	1	0.04 [@]	
2010 [‡]	2	3.0 ^{&}	C ² S: 2.7 (1968Sm05).
2460 [‡]	(1)	0.004 [@]	
2670 [‡]	0	0.70 ^a	C ² S: 0.34 (1968Sm05).
2884 [‡]			
2960 [‡]	3	0.10	C ² S: 0.17 (1968Sm05).
3080 [§] 20			
3220 20			
3410 20	0	0.10 ^a	C ² S: 0.049 (1968Sm05).
3510 20	2	0.34 ^c	C ² S: 0.22 (1968Sm05).
3750 20	2	0.31 ^c	C ² S: 0.21 (1968Sm05).
3850 20	0	0.19 ^a	C ² S: 0.11 (1968Sm05).
4120 20	2	0.48 ^c	C ² S: 0.49 (1968Sm05).
4830 20	2	0.16 ^c	C ² S: 0.11 (1968Sm05).
5140 20			
5330 20			
5500 20	2	0.16 ^c	
5852 [‡]	2	0.97 ^{&}	C ² S: 1.7 (1968Sm05).
6000 20	0	0.14 ^a	
6120 20			
6530 20			
6852 [‡]	0	0.35 ^a	E(level): Analog to the 980 state in ^{41}K (1972Ma23). C ² S: 0.85 (1968Sm05).
7170 20	3	0.09 ^b	E(level): Analog to the 1290 state in ^{41}K (1972Ma23). C ² S: 0.20 (1968Sm05).
7440 [§] 20	0+2	=0.05, 0.16	C ² S: C ² S=0.05 for $J\pi=1/2+$ and C ² S=0.16 for $J\pi=(5/2+)$.
7780 20	0	0.04 ^a	
7990 [§] 20	0+2	=0.02, 0.04	C ² S: C ² S=0.02 for $J\pi=1/2+$ and C ² S=0.04 for $J\pi=(5/2+)$.
8180 20			E(level): Analog to the 2310 state in ^{41}K (1972Ma23).
8300 20	2	0.07 ^c	E(level): Analog to the 2450 state in ^{41}K (1972Ma23).
8560 20	0	0.13 ^a	E(level): Analog to the 2670 state in ^{41}K (1972Ma23).
8650 20	(2)	0.18 ^c	
9110 20	(2)	0.12 ^c	
9370 20	2	0.31 ^c	
10950 20	2	0.14 ^c	

[†] From 1972Ma23. L-values assigned to 13 groups by 1968Sm05 are in agreement with those from 1972Ma23.

[‡] Rounded off values from Adopted Levels.

⁴²Ca(p,d) 1972Ma23,1968Sm05 (continued)

⁴¹Ca Levels (continued)

§ Doublet.

C²S corresponding to J π = 7/2-.

@ C²S corresponding to J π = 3/2-.

& C²S corresponding to J π = 3/2+.

a C²S corresponding to J π = 1/2+.

b C²S corresponding to J π = (7/2)-.

c C²S corresponding to J π = (5/2)+.

⁴²Ca(d,t) 1969Yn01

1969Yn01: E(d)=21.4 MeV from Argonne cyclotron. Scattered particles detected with a (dE/dx)-E telescope of surface barrier detectors with FWHM=70-130 keV. Measured $\sigma(\theta)$. Extracted spectroscopic factors from DWBA analysis code JULIE.

⁴¹Ca Levels

E(level)	J π	L	C ² S	Comments
0.0	7/2-	3	2	
1940 40	3/2-	1	0.3	
2010 40	3/2+	2	2.4	
2470 40			>0.015	L: 1969Yn01 list L=1 in Table II, but no $\sigma(\theta)$ distribution is shown in Figure 4 of their paper. This level is populated weakly in (d,t).
2670 40	1/2+	0	0.46	
2970 40	(1/2+)	0, (3)	0.026	J π ,L,C ² S: This level could be fitted with L=3 with J π =(5/2-,7/2-) and C ² S= 0.13. J π =7/2- in (p,t) and (³ He, α).
3450 40	1/2+	0	0.12	E(level): from Figure 4 and text of 1969Yn01. 3410 in Table II.
3520 40	(5/2+)	2	0.30	C ² S: for 1d3/2 orbital.
3740 40	(3/2+)		>0.1	L: 1969Yn01 list L=2 in Table II, but no $\sigma(\theta)$ distribution is shown in figure 4 of their paper. The authors state that this state was not excited with sufficient intensity to extract a reliable $\sigma(\theta)$.
3840 40	1/2+	0	0.12	
3920 40	(1/2+)	0	0.12	
4150 40	(5/2+)	2	0.46	C ² S: for 1d5/2 orbital.

⁴²Ca(³He, α) 1967Ly04

1967Ly04: E(³He)= 18 MeV (also 1968Ly01 with E(³He)= 14-28 MeV) from the Heidelberg Tandem. Measured $\sigma(\theta)$ using the magnetic spectrograph with dE/dx-E counter telescope. DWBA analysis using the code JULIE used to extract spectroscopic factors and angular momentum transfer.

1971Ra35: E(³He)= 13 MeV from the MIT -ONR generator. α detected with nuclear emulsion technique. Measured $\sigma(\theta)$ for g.s. and 2017 keV. DWBA analysis used to extract angular momentum transfer and spectroscopic factors.

1974La14: E(³He)= 15 and 18 MeV from the Orsay Tandem. FWHM (E/ Δ E) detectors =20-40 keV. Groups observed at 2010, 2670, 5840, 6850, 8540 and 9371 keV.

⁴¹Ca Levels

E(level)	L	C ² S [†]	Comments
0.0	3	1.6 [‡]	C ² S: Others: 1.3 (1971Ra35), 2.0 (1968Ly01).
1942 15	1	0.15 [#]	
2017 15	2	2.0 [@]	C ² S: Others: 2.7 (1971Ra35), 2.4 (1968Ly01).
2459 15	1	0.01 [#]	
2571 15	(3)	(0.02) [§]	
2610 15	3	0.04 [‡]	
2680 15	0	0.65 ^{&}	
2887 15			
2969 15	3	0.14 [‡]	
3210 15	(3)	(0.01) [§]	
3401 15	0	0.12 ^{&}	

Continued on next page (footnotes at end of table)

$^{42}\text{Ca}(^3\text{He},\alpha)$ 1967Ly04 (continued) ^{41}Ca Levels (continued)

E(level)	L	$C^2S^\dagger$	Comments
3527 15	3	0.11 $\frac{1}{2}$	
3620 15			
3749 15	2	0.26@	
3862 15	0	0.19&	
3946 15	1	0.03 ^a	
4018 15	(3)	(0.01) $\frac{1}{2}$	
4108 15	3	0.13 $\frac{1}{2}$	
4296 15			
4618 15	1	0.01 ^a	
4648 15			
4742 15	1	0.01 ^a	
4832 15	2	0.10@	
4888 15	(3)	0.07 ^c	
4986 15	4	0.05 ^f	
5017 15			
5129 15	(3)	(0.03) $\frac{1}{2}$	
5178 15			
5300 15	2	0.05@	
5425 15	(3)	(0.02) $\frac{1}{2}$	
5505 15	3	0.07 $\frac{1}{2}$	
5651 15	3	0.04 ^c	
5765 15			
5852 15	2	2.3@	T=3/2. E(level): Analog of ^{41}K g.s. (1967Ly04).
5997 15	0	0.23&	
6117 15	2	0.04@	
6472 15			
6530 15			
6688 15	(3)	(0.22)	
6851 15	0	0.54&	T=3/2. E(level): Analog of 980 level in ^{41}K (1967Ly04).
6913 15			
6966 15	2	(0.03) ^e	
7030 15			
7173 15	3	0.37 $\frac{1}{2}$	T=3/2. E(level): Analog of 1294 level in ^{41}K (1967Ly04).
7321 15	3	0.11	
7367 15	0	0.05&	T=3/2. E(level): Analog of 1593 level in ^{41}K (1967Ly04).
7539 15			
7587 15	3	0.06	
7639 15	(0)	(0.02) ^b	
7759 15	0	0.07&	
8117 15	2	0.06 ^d	
8172 15			
8212 15			
8317 15	2	0.26@	T=3/2. E(level): Analog of 2440 level in ^{41}K (1967Ly04).
8444 15	(1)	(0.06)	
8543 15	0	0.40&	T=3/2. E(level): Analog of 2676 level in ^{41}K (1967Ly04).
8648 15			T=3/2. E(level): Possible analog of 2757 level in ^{41}K (1967Ly04).
8741 15			
8787 15			
8977 15			
9047 15	2	0.16 ^d	
9140 15			
9216 15			
9371 15	2	0.67@	T=3/2. E(level): Possible analog of 3488 level in ^{41}K (1967Ly04).
9875 15			
10177 15			

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$^{42}\text{Ca}(^3\text{He},\alpha)$ 1967Ly04 (continued) ^{41}Ca Levels (continued)

E(level)	L	C ² S [†]
10348 15		
10752 15		
10859 15	2	0.19 ^d
11817 15		

[†] Corresponding to $J\pi$ given by authors in 1967Ly04. See footnote for $J\pi$ used in the determination of C²S.

[‡] C²S corresponding to $J\pi = 7/2-$.

[§] C²S corresponding to $J\pi = (7/2-)$.

[#] C²S corresponding to $J\pi = 3/2-$.

@ C²S corresponding to $J\pi = 3/2+$.

& C²S corresponding to $J\pi = 1/2+$.

a C²S corresponding to $J\pi = 1/2-$.

b C²S corresponding to $J\pi = (1/2+)$.

c C²S corresponding to $J\pi = 5/2-$.

d C²S corresponding to $J\pi = 5/2+$.

e C²S corresponding to $J\pi = (5/2+)$.

f C²S corresponding to $J\pi = 9/2+$.

 $^{42}\text{Ca}(^3\text{He},\alpha\gamma)$ 1975Fo15,1975Ta05

1975Fo15: E(³He)=18 MeV from the Orsay MP tandem. Measured E γ , I γ , $\gamma(\theta)$, α -particle spectrum, $\alpha\gamma$ -coin, branching ratios using surface barrier and Ge(Li) detectors (FWHM = 4 keV), and lifetimes by Doppler-shift attenuation method.

1975Ta05: E(³He)=18 MeV from University of Pennsylvania tandem. Outgoing particles were detected with a solid-state position-sensitive detector at 0° with respect to the beam and the γ -rays were detected using a Ge(Li) detector. Measured γ , $\alpha\gamma$ -coin, $\gamma\theta$. Determined mixing ratio, branching ratio and $J\pi$.

 ^{41}Ca Levels

E(level)	$J\pi$ [§]	T _{1/2} [#]	Comments
0.0	7/2-		
1943	3/2-		
2010	3/2+		
2605	5/2+		
2670	1/2+		
2960 [†]	7/2-		
3200 [†]	9/2+		
3400	1/2+		
3526 [†]	3/2+		
3740	(3/2, 5/2)+		
3848	1/2+		
4090	5/2+		E(level): Given as 4094 in Fig.2 (1975Fo15).
4185 [‡]	(3/2, 5/2)		
4416			
4728	(3/2)+		
5817.2 9	3/2+	<28 fs	E(level): T=3/2 analog of ⁴¹ K g.s. This level is populated strongly in (³ He,t) (1975Ta05).
6822.3 9	1/2+	<28 fs	E(level): T=3/2 analog of 980 state in ⁴¹ K.
7146 [†]			
8540 [†]	1/2+		Level decays principally (98% I) to ⁴⁰ Ca g.s. through 180-keV s-wave neutron branch. γ transitions from this level were not determined. However authors (1975Ta05) conclude that a weak γ decay branch does exist.

[†] Level not reported by 1975Fo15.

[‡] Level not reported by 1975Ta05.

[§] From Adopted Levels.

[#] From DSAM lifetime measurements in 1975Ta05.

$^{42}\text{Ca}(^3\text{He},\alpha\gamma)$ 1975Fo15,1975Ta05 (continued) $\gamma(^{41}\text{Ca})$

A_2 and A_4 are from 1975Ta05, except for γ rays from 5817 level which are from 1975Fo15.

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\ddagger}$	Mult. [§]	$\delta^{\S}$	Comments
1943	1943	100			
2010	2010	100	M2+E3	+0.095 22	$A_2=+0.050$ 17, $A_4=-0.019$ 25.
2605	2605	100			
2670	660	29			
	727	71			
2960	2960	100	M1+E2	-0.31 3	$A_2=+0.173$ 3, $A_4=-0.003$ 44.
3200	3200		E1 (+M2)	+0.09 7	δ : or -9 +38-19. $A_2=-0.153$ 139, $A_4=+0.136$ 209.
3400	1390	100			
3526	856		M1+E2	+0.22 7	δ : or -3.11+59-90. $A_2=-0.100$ 135, $A_4=+0.168$ 200.
3740	1135 [#]	33			δ : -0.15 3 given by 1975Ta05 assuming $J(3740)=3/2$. $A_2=-0.130$ 56, $A_4=-0.028$ 84.
	1730	67			E γ : Unresolved with the 1723 γ transition from 5817.2 (1975Fo15). δ : +0.03 5 given by 1975Ta05 assuming $J(3740)=3/2$. $A_2=+0.164$ 48, $A_4=-0.002$ 71.
3848	1838	78			
	1902	22			
4090	2080	70	M1+E2	+0.06 5	$A_2=-0.126$ 47, $A_4=+0.016$ 71 for the unresolved doublet 2010-2080.
	4090	30	E1 (+M2)	+0.01 4	E γ : Unresolved with the 2077 γ transition from 5817.2 (1975Fo15). δ : or -8.5 +21-41. $A_2=-0.143$ 55, $A_4=-0.150$ 84.
4185	2175				
4416	2406 ^{&}				
	2473				
4728	2718	100			
5817.2	1089 [@]	11 2			$A_2=-0.70$ 21. δ : > 0.3 for $J_{\pi}=5/2$.
	1723	53 4			E γ : Unresolved with the 1730 γ transition from 3740 (1975Fo15).
	2077	8 5			E γ : Unresolved with the 2080 γ transition from 4090 (1975Fo15).
	2417	16 2			$A_2=-0.51$ 5. δ : -0.03 14 or -1.7 5.
	3212	12 2			I γ : 7 3(1975Ta05). δ : -0.25 +30-65 or -1.8 +9-40. $A_2=+0.15$ 12.
	3807	<3			I γ : 4 (1975Ta05).
6822.3	2094	24 2			I γ : 34 6 (1975Ta05).
	2406 ^{@&}	6 4			
	2637 [@]	7 2			
	2974	16 2			I γ : 10 5 (1975Ta05).
	3082	9 2			I γ : 20 6 (1975Ta05).
	4152	38 2			I γ : 31 6 (1975Ta05).
	4812	<2			I γ : 5 3 (1975Ta05).
7146	4186	35			
	7146	65			

[†] From level-energy differences.

[‡] From 1975Fo15 for 5817 and 6822 levels, others are from 1975Ta05.

[§] From $\gamma(0)$ data (1975Ta05).

[#] γ not reported by 1975Fo15.

[@] γ not reported by 1975Ta05.

[&] Multiply placed.

$^{42}\text{Ca}(^3\text{He},\alpha\gamma)$ 1975Fo15,1975Ta05 (continued)

Level Scheme

Intensities: % photon branching from each level
 * Multiply placed

$^{42}\text{Ca}(^{48}\text{Ti},^{49}\text{Ti})$ 1983Br13

1983Br13: $E(^{48}\text{Ti})=385$ MeV from UNILAC at GSI. Measured $\sigma(\theta)$ at $\theta=7^\circ, 8.5^\circ, 9.75^\circ, 11^\circ, 13^\circ$ and 14.5° using the QQDQ magnetic spectrometer. FWHM=1.3 MeV.

 ^{41}Ca Levels

E(level)

0.0

 $^{43}\text{Ca}(p,t)$ 1977SeZR,1974Se04

$J\pi(^{43}\text{Ca g.s.})=7/2^-$.

1977SeZR (also 1974Se04): $E(p)=42$ MeV from the MSU cyclotron. Measurement was done with an Enge split-pole spectrometer equipped with a single-wire proportional counter. FWHM=22–35 keV. Measured $\sigma(\theta)$ and cross sections to $7/2^-$ levels and compared to $0+$ levels of ^{40}Ca from $^{42}\text{Ca}(p,t)$.

 ^{41}Ca Levels

E(level) [†]	$J\pi$	$L^\dagger$	Comments
0.0	7/2-	0	
1940		2	
2010		3+5	
2460		2+4	
2570		2	E(level): 2580 (quoted in 1978En02).
2610		1+3	
2670		3	
2880		3	
2958	7/2-	0	Integrated cross section is about 9% of that for g.s. (1974Se04). $J\pi$: From 1974Se04.
3050			L: 2 (quoted in 1978En02, but none in 1990En08).
3200		3	

Continued on next page (footnotes at end of table)

$^{43}\text{Ca}(\text{p,t})$ 1977SeZR,1974Se04 (continued) **^{41}Ca Levels (continued)**

E(level) [†]	L [†]	Comments
3370	3	
3400	3	
3530	3	
3614 [‡]	3	L: for 3613+3614.
3680	2	
3730 [‡]	3	L: for 3730+3740.
3830	5	
3910	3+5	
4010	2	
4090	3	
4280	2	
4340	2	
4520	5	
4730 [‡]	3	L: for 4728+4731.
4970	3(+5)	
5050 [‡]	2	L: for 5050+5070.
5120		L: 2 (quoted in 1978En02, but none in 1990En08).
5220	5	
5350	0	
5820	3+5	
5960	3	
6040 [‡]	3	L: for 6040+6070.
6820	3	
7150	0	

[†] Data given here are taken from the evaluation by 1990En08, based on experiments of 1977SeZR (also 1974Se04).

[‡] Doublet.

(H1,xn γ) 1978Eg01,1975Ol01,1974Li07

Main References:

1978Eg01: $^{26}\text{Mg}(^{18}\text{O},3\text{n}\gamma)$, $E(^{18}\text{O})=34$ MeV Utrecht EN tandem accelerator. Detected gammas with Ge(Li) detectors, compton separation spectrometer and Ge(Li) compton polarimeter. Measured $E\gamma$, $I\gamma$, $\gamma(\theta)$, $\gamma(\text{lin pol})$.

1975Ol01 (also 1973Go31): $^{26}\text{Mg}(^{18}\text{O},3\text{n}\gamma)$, $E(^{18}\text{O})=40$ MeV (also 36 MeV) from Brookhaven National Laboratory. Detected gammas with Ge(Li) detectors and polarimeter. Measured $E\gamma$, $I\gamma$, $\gamma(\theta)$, $\gamma(\text{lin pol})$.

1974Li07: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=32.5-44$ MeV. Detected gammas with Ge(Li) detectors. Measured $E\gamma$, lifetimes by Doppler-shift attenuation method.

Others:

2011Ch54: $^{27}\text{Al}(^{16}\text{O},\text{X}\gamma)$. $E(^{16}\text{O})=34$ MeV. Measured $E\gamma$, $\gamma\gamma(\theta)$, $\gamma\gamma(\text{lin pol})$ and anistostropy ratio (see 2011ChZU).

2008Sa04 (also 2008Sa44): $^{24}\text{Mg}(^{24}\text{Mg},\alpha 2\text{pn}\gamma)$. $E(^{24}\text{Mg})=45.7$ MeV. Seven γ rays from the decay of a $J\pi=36+$ resonance into the fusion-evaporation channels were measured.

1992Pa01: $^{12}\text{C}(^{32}\text{S},2\text{pn}\gamma)$, $E(^{32}\text{S})=115$ MeV. g -factor of 3830 level used as a reference in the measurement of g -factor of $19/2-$ state in ^{39}K . Three γ -rays reported at 460, 3200 and 3369.

1978Cl09: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=34$ MeV. Measured $E\gamma$, lifetime by recoil-distance method.

1976Ra05: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=32.5$ MeV. Measured $E\gamma$, $\gamma(\theta,\text{t})$ and deduced lifetime and hyperfine perturbations.

1976Ke02: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=30$ MeV. Measured $E\gamma$, lifetimes by recoil-distance Doppler-shift attenuation method.

1976Me09: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=34$ MeV. Measured $E\gamma$, lifetimes by recoil-distance Doppler-shift method.

1975Ki05: $^{28}\text{Si}(^{16}\text{O},2\text{pn}\gamma)$, $E(^{16}\text{O})=40$ MeV. Measured lifetime for 3830 level by $\gamma(\theta)$.

1975Uh02: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=32.5$ MeV. Measured g -factor of 3830 level by IMPAC (time Dependent Perturbed Angular Distribution) method.

1975Yo05: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=48$ MeV. Measured g -factor of 3830 level by TDPAD (Perturbed Angular Correlation after Ion Implantation) method.

1975Bo44: $^{27}\text{Al}(^{16}\text{O},\text{pn}\gamma)$, $E(^{16}\text{O})=30-35$ MeV. Measured g -factor of 3830 level by IMPAD (Perturbed Angular Correlation after Ion Implantation) method.

1973Go31: $^{26}\text{Mg}(^{18}\text{O},3\text{n}\gamma)$, $E(^{18}\text{O})=20-60$ MeV. Measured $E\gamma$, $\gamma\gamma$, $\gamma(\theta)$, lifetimes by recoil-distance method.

(HI,xn γ) 1978Eg01,1975O101,1974Li07 (continued) ^{41}Ca Levels

E(level) [†]	J $\pi^{\ddagger}$	T _{1/2}	Comments
0.0	7/2-		
2009.8	3/2+	0.46 ns 5	T _{1/2} : From 1976Ke02.
3201.26 14	9/2+	19 fs 17	T _{1/2} : From 1973Go31.
3369.63 13	11/2+	20.6 ps 10	T _{1/2} : Weighted average of 21.1 ps 10 (1978Cl09), 17.3 ps 28 (1976Me09), 19.4 ps 35 (1974Li07), 20.5 ps 14 (1973Go31).
3829.84 15	15/2+	3.00 ns 10	g=+0.29 2. g: From (1975Yo05). Other: +0.32 4 (1975Uh02). T _{1/2} : Weighted average of 3.19 ns 21 (1976Ra05), 2.98 ns 35 (1976Me09), 2.88 ns 14 (1975Ki05), 3.05 ns 21 (1974Li07), 3.12 ns 35 (1973Go31).
3915.04 20	13/2+	1.9 ps 4	T _{1/2} : Weighted average of 2.08 ps 69 (1976Me09), 1.80 ps 55 (1974Li07).
5219.06 25	(13/2, 17/2)+	<0.35 ps	T _{1/2} : From 1974Li07. Other: < 1.4 ps (1976Me09,1973Go31).
6826.3 5		<1.7 ps	T _{1/2} : From 1976Me09. Other: >0.14 ps (1973Go3107).

[†] From least-squares fit to E γ 's.[‡] From Adopted Levels. $\gamma(^{41}\text{Ca})$

E(level)	E $\gamma^{\ddagger}$	I $\gamma^{\#}$	Mult. @	Comments
3201.26	3201.11 20		E1	A ₂ =-0.21 2, A ₄ =0, (1978Eg01). A ₂ =-0.33 3, POL=+0.66 25(19775O101). POL=+0.029 8 (2011Ch54).
3369.63	168.34 [‡] 10	60 3	M1	A ₂ =-0.216 16, A ₄ =0 (1978Eg01). Mult.: Other: M1+E2 from 1975O101.
	3369.50 15	40 3	M2+E3	A ₂ =+0.77 2, A ₄ = +0.25 2 (1978Eg01). A ₂ =+0.67 4, A ₄ = +0.22 4, POL=+0.6 10 (19775O101).
3829.84	460.20 10		E2	A ₂ =+0.345 7, A ₄ =-0.107 8, POL=+0.67 7 (1978Eg01). A ₂ =+0.26 3, A ₄ =-0.11 3, POL=+0.42 7 (1975O101). POL=+0.147 8 (2011Ch54).
3915.04	545.40 15		(M1)	A ₂ =+0.36 7, A ₄ =0, POL=-0.11 7 (1975O101). POL=-0.065 15 (2011Ch54). Mult.: Other: M1+E2 from 1975O101.
5219.06	1389.21 25		(M1)	A ₂ =-0.11 9, A ₄ =0, POL=-0.30 20 (1978Eg01). A ₂ =-0.21 14, A ₄ =0, POL=-0.25 28 (1975O1011). Mult.: Other: M1+E2 from 1975O101.
6826.3	1607.24 [§] 40		E1	A ₂ =-0.31 10, A ₄ =+0.04 9, POL=-0.37 14 (1975O101). Mult.: From $\gamma(0)$ and $\gamma(\text{lin pol})$ in 1975O101.

[†] Weighted averages from 1978Eg01 and 1975O101 unless otherwise stated.[‡] From 1978Eg01.[§] From 1975O101.[#] Weighted average of branching ratios in 1973Go31 and 1978Eg01.[@] From $\gamma(0)$ and $\gamma(\text{lin pol})$ in 1978Eg01 except as noted.Level Scheme

Intensities: % photon branching from each level

Adopted Levels, Gammas

Q(β⁻)=-12940 30; S(n)=16190 3; S(p)=1085.00 8; Q(α)=-6267.13 13 2012Wa38.
S(2n)=30612 24; S(2p)=9413.16 8 (2012Wa38).

⁴¹Sc Levels

With S(p)=1085 keV, all excited states are proton unbound and decay predominantly by proton decay to ⁴⁰Ca.

Cross Reference (XREF) Flags

A ⁴¹Ti ε Decay (81.9 ms)
B ⁴⁰Ca(p,γ)
C ⁴⁰Ca(p,p),(p,p'γ): Res
D ⁴⁰Ca(d,n)

E ⁴⁰Ca(³He,d),(pol ³He,d)
F ⁴⁰Ca(α,t)
G ⁴⁰Ca(⁷Li,⁶He)
H ⁴⁰Ca(¹²C,¹¹B)

I ⁴⁰Ca(¹³C,¹²B)
J ⁴⁰Ca(¹⁶O,¹⁵N)
K ⁴⁰Ca(²⁸Si,²⁷Al)
L ⁴³Cr ε2p Decay (21.2 ms)

E(level) [†]	Jπ [‡]	XREF	T _{1/2} or Γ	Comments
0.0	7/2-	B DEFGHIJKL	596.3 ms 17	%ε+%β ⁺ =100; Q=-0.156 3 (2002Mi37); μ=+5.4305 18 (1990Mi16). μ: β-NMR method. See also 1990Mi17, 1990Mi18. Other: 5.425 4 (2013Is07, β-NMR). Q: β-NMR method. See also 2001Mi40. Earlier results of same group 0.166 8 (1993Mi09) and 0.120 6 (1990Mi19). T _{1/2} or Γ: from 1973Al11. Others: 591 ms 5 (1973Ta04), 596 ms 6 (1965Yo02), 550 ms 30 (1962Cr04), 870 ms 50 (1960Wa04), 870 ms 30 (1941El03). Also: 1960Ja12, 1952Ma55. Jπ: L(d,n)=L(³ He,d)=L(α,t)=3 and (pol ³ He,d); log ft=3.45 to 7/2- mirror nuclide.
1716.48 8	3/2-	B DEFG I		%p>98; %IT<2. Jπ: L(d,n)=L(³ He,d)=L(α,t)=1; γ to 7/2-.
2096.0# 5	3/2+	AB DEF		Radiative T _{1/2} =0.36 ps 11 from Γ _γ =0.0013 eV 4 in (p,γ). Other: 0.30 ps from Γ _γ =0.02 eVb, also in (p,γ). XREF: F(2077). %p>99; %IT<1.
2414.9 5	3/2-	B DEF		Jπ: J from γ(θ) in (p,γ), π from L(d,n)=L(³ He,d)=L(α,t)=2. %p>50; %IT<50.
2588.30 7	5/2-	B D		Jπ: L(d,n)=L(³ He,d)=1, 1830γ from 5/2+. %p>90; %IT<10.
2666.84 7	5/2+	AB E		Jπ: 5/2 or 9/2 from γ(θ) in (p,γ), 872γ to 3/2- rules out J=9/2. D+Q for 2588γ to 7/2- with large value of δ favors no change in parity. XREF: E(2686). %p>98; %IT<2.
2719.38 9	1/2+	AB D		Jπ: log ft=5.0 from 3/2+ parent, D(+Q) 2667γ to 7/2-.
2882.47 8	7/2+	B EF I		Jπ: L(d,n)=0. XREF: F(2895). %p=59 2; %IT=41 2.
2972.3 2	7/2	B E		Jπ: L(³ He,d)=4; 786γ to 3/2+.
3014 4	(3/2-, 5/2, 7/2+)	B		Jπ: γ(θ) in (p,γ); mirror level to 7/2- in ⁴¹ Ca suggests π=-.
3185.4 2	(5/2-)	B EF I		%p>99; %IT<1. Jπ: 917γ to 3/2+ and 3013γ to 7/2-.
3358.1 7	(11/2+)	B F		XREF: I(3150). %p>92; %IT<8.
3411.8 4	1/2+	ABC	1.80 keV 18	Jπ: L(³ He,d)=3, γ(θ) in (p,γ) gives J=5/2 or 9/2.
3465@ 4	1/2-	bCDe	50 keV 20	Jπ: from γ(θ) in (p,γ) and γ from 9/2+.
3480@ 5	1/2-	bC e	12.0 keV 15	
3563.0 3	3/2+	AB		Jπ: log ft=5.1 from 3/2+ parent, comparison to GT transition strengths for isospin analog state of 3526 keV in ⁴¹ Ca (2004Fu28,2014Ka01). XREF: A(?).
3678# 3	(3/2-, 5/2, 7/2-)	AB		Jπ: 1962γ to 3/2- and 3678γ to 7/2-. If corresponds to level observed in ⁴¹ Ti ε decay, 5/2+ would be favored from log ft=5.6 from 3/2+ parent.
3697.1 3	7/2	B F		E(level): could also correspond to 3690 130 level observed in ⁴¹ Ti ε decay. Jπ: from γ(θ) in (p,γ).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

 ^{41}Sc Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	XREF	T _{1/2} or Γ	Comments
3732@ 3	1/2-	CDE	12.0 keV 12	J π : L($^3\text{He},d$)=1; p(θ).
3774@ 3	3/2-	BCd f	0.70 keV 7	J π : assignment from p(θ) in (p,p) inconsistent with D(+Q) 3775 γ to 7/2- in (p, γ).
3781.2 2	(5/2+)	B d f		J π : $\gamma(\theta)$ and 3780 γ to 7/2-, tentative 1062 γ to 1/2+, 898 γ to 7/2+.
3788@ 5	3/2+, 5/2+	C f	0.20 keV 2	
3808§ 12	(1/2, 3/2, 5/2)+	A F		J π : log ft=5.2 from 3/2+ parent.
3905 20		F		
3969@ 5	1/2+	ABC	4 keV	
4023.3 4	(7/2-)	B eF		XREF: F(4005). J π : from $\gamma(\theta)$ and RUL in (p, γ); supported by D+Q 4023 γ to 7/2- with large δ value which favors $\Delta\pi$ =no. However, L($^3\text{He},d$)=(3,4) suggests 5/2-, 7/2+ for a 4030 20 group. XREF: F(4038).
4030.7 6	7/2-	B eF		J π : from $\gamma(\theta)$ and RUL in (p, γ), supported by D+Q 4030 γ to 7/2- with large δ value which favors $\Delta\pi$ =no. See also comment for 4022.8 level.
4245# 4	5/2+	AB		J π : from $\gamma(\theta)$ and RUL in (p, γ).
4328# 4	5/2+	AB		XREF: A(4310). J π : from log ft=5.3 from 3/2+ parent and 4328 γ to 7/2-.
4441 4	(5/2-, 7/2-)	B		J π : from $\gamma(\theta)$ and RUL in (p, γ).
4502@ 4	3/2+	A C f	1.0 keV 2	
4514# 4	(9/2+)	B Ef		J π : 5/2 or 9/2 from $\gamma(\theta)$ in (p, γ), L($^3\text{He},d$)=4.
4535 4	3/2-	C	12 keV 3	
4644 4	1/2-	C	36 keV 10	
4656 12	(1/2, 3/2, 5/2)+	A		J π : from log ft=5.4 from 3/2+ parent.
4777@ 4	3/2+	A C	3 keV 1	
4810# 3	(5/2-, 7/2-, 9/2+)	B E		J π : from $\gamma(\theta)$ in (p, γ) and L($^3\text{He},d$)=(3,4).
4867@ 4	5/2+	ABC	2.0 keV 5	
4929 5	5/2+	A		J π : log ft=4.2 from 3/2+ parent; comparison to GT transition strengths for isospin analog state of 4815 keV in ^{41}Ca (2004Fu28,2014Ka01).
4947 4	5/2+	C	1.0 keV 2	
4949@ 4	5/2-	BCD	2.0 keV 4	T _{1/2} or Γ : other: 2.4 keV 6 in (p, γ).
5011# 3	(7/2-)	B f		J π : from $\gamma(\theta)$ and RUL in (p, γ).
5023@ 4	1/2+	A C f	6 keV 2	XREF: A(5007).
5037.5 14	9/2+	BCDEFG I	0.4 keV 1	J π : $\gamma(\theta)$ in (p, γ), L($^3\text{He},d$)=4.
5074 4	1/2-	C	3 keV 1	
5084@ 4	3/2+	A C	0.7 keV 2	XREF: A(5067).
5143@ 4	3/2-	BC	3 keV 1	
5167 5		B		
5200 7		B		
5225 9		B		
5324 7		B		
5356 5	3/2+	C	3 keV 1	
5374@ 4	5/2+	ABC	7 keV 2	T _{1/2} or Γ : other: 9.5 keV 30 in (p, γ).
5396 5	3/2-	C	4 keV 1	
5419@ 5	5/2+	C E	18 keV 5	
5490 5	1/2-	C	12 keV 4	
5493@ 5	1/2+	A C	1.0 keV 2	
5520@ 5	5/2-	BC e	0.5 keV 2	
5534@ 5	3/2-	BC e	20 keV 5	
5568# 9		B ef		
5576@ 5	3/2+	ABC f	6 keV 2	J π : comparison to GT transition strengths for isospin analog state of 5480 keV in ^{41}Ca (2004Fu28,2014Ka01).
5649@ 5	5/2-	BC	3 keV 1	
5690@ 5	1/2-	BC	1.0 keV 3	
5704@ 5	1/2-	BC	12 keV 4	T _{1/2} or Γ : other: 11.5 keV 30 from (p, γ).
5708@ 5	5/2-	BCDE	12 keV 4	
5755 5	3/2-	C	7 keV 3	
5773# 4	5/2+	AB		J π : from log ft=5.0 from 3/2+ parent; comparison to GT transition strengths for isospin analog state of 5652 keV in ^{41}Ca (2004Fu28,2014Ka01).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{41}Sc Levels (continued)

E(level) [†]	J π [‡]	XREF	T _{1/2} or Γ	Comments
5801 8		B		
5810 4		B		
5836@ 5	5/2+	A C	8.7 keV	J π : comparison to GT transition strengths for isospin analog state of of 5717 keV in ^{41}Ca (2004Fu28,2014Ka01).
5862 20	5/2-	b DE		J π : L($^3\text{He},d$)=3 and pn(θ) in (d,n). E(level): from ($^3\text{He},d$),(pol $^3\text{He},d$).
5867@ 4	5/2+	bC	12.3 keV	
5885§ 11	5/2+	Ab		J π : from log ft=4.7 from 3/2+ parent; comparison to GT transition strengths for isospin analog state of 5756 keV in ^{41}Ca (2004Fu28,2014Ka01). E(level): possibly the same as the 5867-keV level.
5915 11		B		
5941@ 5	3/2+	ABC	55 eV 5	T=3/2.
5971@ 5	5/2-, 7/2-	BCD	4.2 keV 20	T _{1/2} or Γ : from (p, γ). Other: 6.6 keV from (p,p).
5986 5	3/2-	C	8.7 keV	
6013 5	1/2+	C	26.7 keV	
6036 11	1/2+	A		J π : from log ft=4.8 from 3/2+ parent; comparison to GT transition strengths for isospin analog state of 5890 keV in ^{41}Ca (2004Fu28,2014Ka01).
6047@ 5	3/2-	BC	12.1 keV	T _{1/2} or Γ : other: 3.9 keV 10 for 6058 11 in (p, γ).
6085@ 5	(1/2, 3/2, 5/2)+	ABC		J π : from log ft=4.8 from 3/2+ parent.
6112# 11		AB		XREF: A(?).
6116 11		B		
6131 5	3/2+, 5/2+	C	2.9 keV	
6147@ 5	5/2+	ABC	2.9 keV	
6203 5	3/2-	C	6.5 keV	
6236 5	5/2-, 7/2-	C	8.3 keV	
6259 5		C		
6314 5		C		
6326 5		C		
6335 5	1/2+	C	27.9 keV	
6361@ 5	5/2+	a C	2.8 keV	
6399@ 5	3/2+, 5/2+	a C	8.1 keV	
6414@ 5	5/2+	A C	6.0 keV	XREF: A(6435).
6435@ 5	5/2-	Cde	10.4 keV	
6458 5	(3/2-)	C	4.9 keV	
6469@ 5	5/2-	Cde	12.1 keV	
6475@ 5	(1/2, 3/2, 5/2)+	A C		XREF: A(6468). J π : from log ft=4.7 from 3/2+ parent.
6507 5		C		
6513 5	5/2+	C	18.8 keV	
6522 5		C		
6533@ 5	5/2+	A C	1.3 keV	XREF: A(6560).
6572 5	5/2-	C	4.5 keV	
6585 5	1/2-	C	4.5 keV	
6589 5	1/2+	C		
6610 5	1/2+	C	9.5 keV	
6622 5	5/2+	C	3.2 keV	
6643 5		C		
6651 5	9/2+	C	4.0 keV	
6673 40	(1/2, 3/2, 5/2)+	A		E(level): this level may correspond to 6643 and/or 6700 levels observed in (p,p),(p,p' γ):Res. J π : from log ft=4.7 from 3/2+ parent.
6691 5	3/2-	C	3.2 keV	
6700 5	5/2+	C	6.2 keV	
6730 5		C		
6741 5	5/2+	C	7.2 keV	
6752 5		C		
6772 5	(3/2-)	C		
6783 5	5/2-	C	10.4 keV	
6824@ 5	5/2+	A C	4.1 keV	
6841 5	5/2-	C	6.3 keV	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

 ^{41}Sc Levels (continued)

E(level) [†]	Jπ [‡]	XREF	T _{1/2} or Γ	Comments
6857 5	3/2-	C	9.6 keV	
6872@ 5	(1/2, 3/2)-	C e		
6877§ 40	(1/2, 3/2, 5/2)+	A e		Jπ: from log ft=4.5 from 3/2+ parent.
6880@ 5	9/2+	C e	1.3 keV	
6895@ 5	(9/2+)	C e	3.4 keV	
6908@ 5	5/2-	C e	6.9 keV	
6923@ 5	(5/2)-	C e	4.5 keV	
6947@ 5	(1/2, 3/2, 5/2)+	A C	1.3 keV	Jπ: from log ft=5.4 from 3/2+ parent.
6970 5	5/2+	C	6.9 keV	
6996 5	9/2+	C	1.3 keV	
7004 5	(9/2+)	C	<1.0 keV	
7022@ 5		a C		
7033@ 5	5/2+	a C	3.2 keV	
7069 5	5/2-	C	9.3 keV	
7078 5		C		
7107 5	5/2+	C	19.8 keV	
7113 5	(3/2, 5/2)-	C	14.0 keV	
7123 5		C	7.7 keV	
7142 5	5/2+	C	12.0 keV	
7177 5	1/2-, 3/2+, 7/2-	C		
7182 20	(1/2, 3/2, 5/2)+	A		Jπ: from log ft=5.3 from 3/2+ parent. E(level): this level may correspond to 7177, 7201 and/or 7206 levels in (p,p),(p,p'γ):Res.
7201@ 5	5/2+	C i	40 keV	
7206@ 5		C i		
7245 5	5/2-	C	12 keV	
7264		C		
7279 5	5/2+	C	9 keV	
7297 5	(7/2+)	C		
7313		C		
7333 5	5/2+	C	23 keV	
7338 5	5/2-	C		
7347 5	(5/2+)	C	10 keV	
7352 5	(9/2+)	C	8 keV	
7360 19	(1/2, 3/2, 5/2)+	A		Jπ: from log ft=5.4 from 3/2+ parent. E(level): this level may correspond to the 7347 and/or 7382 levels in (p,p),(p,p'γ):Res.
7382@		C e		
7396@ 5	(9/2+)	C e		
7406@ 5	(5/2)	C e		
7421@		C e		
7469 5	(3/2+)	C		
7474 5		C	44 keV	
7489 5	(7/2-, 9/2+)	C		
7494		C		
7523 5	(7/2+)	C		
7538 5	3/2(+)	C	8 keV	
7557 5	3/2-	C	12 keV	
7572 5	3/2+	C	10 keV	
7606 5	(5/2-)	C		
7620 50	(1/2, 3/2, 5/2)+	A		Jπ: from log ft=5.4 from 3/2+ parent. E(level): this level may correspond to 7572 and/or 7650 levels in (p,p),(p,p'γ):Res.
7640 5	(9/2+)	C	30 keV	
7650 5	(5/2+)	C		
7660 5	1/2-	C	30 keV	
7718 5	3/2-	C	20 keV	
7742 5	(3/2+)	C		
7777@ 5	7/2-	C e	35 keV	
7815@ 5	(1/2)	C e		
7830@ 5	5/2-	C e	33 keV	
7855@ 5	(9/2+)	C e	27 keV	
7874 5	(1/2-)	C	20 keV	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{41}Sc Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}$ or Γ	Comments
7894@ 5	(1/2, 3/2, 5/2)+	A C		$J\pi$: from $\log ft=5.3$ from 3/2+ parent. E(level): 7900 50 in ^{41}Ti ε decay could correspond to 7894 and/or 7903 levels in (p,p),(p,p' γ):Res.
7903 5	(1/2)	C		
7938 5		C		
7947 5		C		
7962 5		C		
7981 5		C		
8006 5	(3/2-)	C	25 keV	
8089@ 5	(3/2)-	C e	50 keV	
8147@ 5	(5/2+)	C e	75 keV	
8450 10	(9/2+)	C		
8645@ 10	(9/2+)	C E I		XREF: E(8594).
8879 10	9/2+	C	8 keV	
9128@ 10	9/2+	C e	18 keV	E(level): 9600 520 in ($^3\text{He},d$),(pol $^3\text{He},d$).
9269@ 10	9/2+	C e	10 keV	
9415@ 10	9/2+	C e	11 keV	
9513@ 10	9/2+	C e	15 keV	
9659@ 10	9/2+	C e	16 keV	
9698@ 10	9/2+	C e i	12 keV	
9815@ 10	9/2+	C e i	13 keV	
10500		E		E(level): unresolved multiplet.
11100		I		

[†] Levels reported with <1 keV precision are from (p, γ). Source of level energies known to >1 keV in cases where the level has been observed in more than one dataset are indicated.

[‡] From p(θ) in $^{40}\text{Ca}(p,p),(p,p'\gamma)$:Res, except where noted.

$\S$ From ^{41}Ti ε decay.

From (p, γ).

@ From (p,p),(p,p' γ): Res.

 $\gamma(^{41}\text{Sc})$

E(level)	$E\gamma^{\ddagger}$	$I\gamma^{\ddagger}$	Mult. [‡]	$\delta^{\ddagger}$	Comments
1716.48	1716.5	100			
2414.9	319	<8			
	698	100			
	2414	<5			
2588.30	492	<0.3			
	872	2.5 3			
	2588	100.0 3	(M1+E2) $\S$	1.2 +11-6	
2666.84	571	<0.6			
	950	4.4 8			
	2667	100 8	E1(+M2) #	0.07 +14-7	
2719.38	623	<5			
	1003	100			
	2719	<7			
2882.47	786	0.08 3			
	2883.1 5	100.0 3	E1(+M2)	+0.05 5	
2972.3	876	<0.2			
	2972	100	D(+Q)	0.5 +5-4	
3014	917	100 6			
	3013	15 6			
3185.4	466	<0.3			
	597	<0.2			
	770	<0.2			
	1089	<0.2			
	3185	100	E1+M2 #	+0.18 +4-5	
3411.8	529	<3			
	692	<3			
	745	<3			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
 $\gamma(^{41}\text{Sc})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	Comments
3411.8	823	<2			
	997	<3			
	1695	100			
	3411	<2			
3480	1759	100			$E\gamma$: could also belong to the decay of the 3465-keV level.
	3475	<4			$E\gamma$: could also belong to the decay of the 3465-keV level.
3563.0	1846	100			
	3563	<13			
3678	1962	56 19			
	3678	100 19			
3697.1	684	<0.1			
	814	3.4 4			
	1030	4.5 2	D+Q	0.26 18	
	1109	<0.1			
	1282	<0.1			
	1601	1.1 1			
	3697	100.0 4	D(+Q)	0.06 10	
3774	3774	100			Mult., δ : D(+Q) with $\delta=0.00$ 11 inconsistent with Adopted $\Delta J=2$.
3781.2	768	1.5 15			
	898	3.0 15			
	1062	1.5 15			
	1114	9.0 15			
	1193	1.5 15			
	1685	3.0 15			
	2064	30.0 15			
	3781	100.0 45			
4023.3	1140	<1.0			
	1304	<0.7			
	1356	33.8 14			
	1434	2.8 7			
	1927	0.7 7			
	2306	3.2 8			
	4023	100.0 14	M1+E2 §	+1.1 4	
4030.7	1148	<0.4			
	1442	<0.3			
	1934	<0.2			
	2314	2.0 6			
	4031	100.0 6	M1+E2 §	+1.14 15	
4245	1232	29 2			
	1363	23 1			
	1526	<0.2			
	1578	8.4 6	M1+E2 §	+0.14 9	
	1657	0.8 2			
	1830	1.2 4			
	2149	100 2	M1+E2 §	0.06 2	
	2529	0.4 4			
	4245	32.9 10	E1(+M2) #	0.03 5	
4328	1661	<1.2			
	1740	23 2			
	1913	<1.1			
	2232	<0.7			
	4328	100.0 17			
4441	1255	54 4			
	1558	21 5			
	1721	<2			
	1773	84 4			
	1852	<2			
	4440	100 5			
4514	4514	100	E1(+M2) #	0.035 +18-35	
4810	4810	100	D+Q	0.17 12	
4867	4867	100			
4949	4949	100	M1+E2 §	+0.25 9	

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Adopted Levels, Gammas (continued)
γ(⁴¹Sc) (continued)

E(level)	Eγ [†]	Iγ [†]	Mult. [‡]	δ [‡]
5011	5011	100	M1+E2 §	0.81 16
5037.5	1678.8@ 5	3.8 7		
	2153.9@ 5	36 3	M1+E2	+0.017 +22-7
	5036.9@ 5	100 3	E1+M2 #	+0.017 +8-15
5143	5143	100		
5374	5374	100		
5576	5576	100		
5649	5649	100		
5708	5708	100		
5941	1694.0@ 4	100 12	M1(+E2) §	-0.04 8
	2161.0@ 15	8 5		
	2523.0@ 24	30 8		
	3270.5@ 15	28 7	M1(+E2) §	-0.41 16
	3843	<22		
5971	5971	100		
6147	6147	100		

[†] From (p,γ), except where noted. γ-ray energies are from level energy differences, rounded off to the nearest keV, except where noted.

[‡] From (p,γ), except where noted.

§ D+Q from γ(θ), Δπ=no from level scheme.

D+Q from γ(θ), Δπ=yes from level scheme.

@ Measured Eγ value from (p,γ).

⁴¹Ti ε Decay (81.9 ms) 1997Ho12,1998Li46,1998Bh12

Parent ⁴¹Ti: E=0; Jπ=3/2+; T_{1/2}=81.9 ms 5; Q(g.s.)=12940 30; %ε+%β⁺ decay=100.

⁴¹Ti decays to ⁴⁰Ca by εp (≈100%).

1997Ho12: ⁴¹Ti activity from the ⁴⁰Ca(³He,2n) reaction at E(³He)=40 MeV, followed by mass separation. Measured Ep, Ip, coincidences using ΔE-E telescope. In another setup, β-γ and p-γ measured with thick plastic scintillator for βs, an ion-implanted silicon detector for βs and protons and a HPGe detector for γs. A summary of these results is also given in 2014Ka01.

1998Li46: ⁴¹Ti activity from the ⁹Be(⁵⁸Ni,X) reaction with E(⁵⁸Ni)=500 MeV/nucleon followed by mass separation. ⁴¹Ti implanted in a stack of eight silicon detectors. Measured Ep, Ip in three central silicon detectors and Eγ, Iγ with an array of 14 Crystal Ball NaI detectors.

1998Bh12: ⁴¹Ti activity from fragmentation of a ⁵⁰Cr beam on a Ni target with E(⁵⁰Cr)=82.6 MeV/nucleon followed by separation with the LISE3 spectrometer. Measured Ep, Ip with a stack of five Si surface-barrier detectors and Eγ, Iγ with five HPGe detectors.

Other main references: 1985Zh05, 1974Se11 (also 1973SeYM), 1973Go06, 1966Po12, 1964Re08. Others (T_{1/2}): 1996Fa09, 1997Tr11.

Others: 1998Jo20, 1986He13, 1983Sh31, 1977Ce05, 1976Sz04, 1973Ha77, Rogers et al: MIT-LNS Prog. rep., 11 (May 1962); but this report is no longer available.

⁴¹Sc Levels

E(level) [†]	Jπ [§]	E(p)(lab) [‡]	Comments
2095 5	3/2+	986 5	E(p)(lab): weighted average of 985 7 (1998Bh12), 976 30 (1998Li46), 986 5 (1997Ho12), 1000 15 (1974Se11).
2666 2	5/2+	1542 2	E(p)(lab): weighted average of 1538 7 (1998Bh12), 1540 20 (1998Li46), 1542 2 (1997Ho12), 1546 15 (1974Se11).
2712 11	1/2+	1587 11	E(p)(lab): weighted average of 1594 25 (1998Bh12) and 1586 11 (1997Ho12).
3414 4	1/2+	2272 4	E(p)(lab): weighted average of 2278 7 (1998Bh12), 2270 25 (1998Li46), 2270 4 (1997Ho12), 2271 10 (1974Se11).
3560 3	3/2+	2414 3	E(p)(lab): weighted average of 2412 8 (1998Bh12), 2440 40 (1998Li46), 2414 3 (1997Ho12), 2409 20 (1974Se11).
3690 130	(3/2-, 5/2, 7/2-)	2540 130	E(level), E(p)(lab): from 1998Li46.
3808 12	(1/2, 3/2, 5/2)+	2655 12	E(p)(lab): weighted average of 2658 12 (1998Bh12), 2654 40 (1998Li46), 2650 12 (1997Ho12), 2662 20 (1974Se11).

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⁴¹Ti ε Decay (81.9 ms) 1997Ho12,1998Li46,1998Bh12 (continued)

⁴¹Sc Levels (continued)

E(level) [†]	Jπ [§]	E(p)(lab) [‡]	Comments
3959 12	1/2+	2803 12	E(p)(lab): weighted average of 2800 12 (1998Bh12), 2817 46 (1998Li46), 2796 14 (1997Ho12), 2814 15 (1974Se11).
4247 5	5/2+	3084 5	E(p)(lab): weighted average of 3087 7 (1998Bh12), 3095 10 (1998Li46), 3080 5 (1997Ho12), 3077 15 (1974Se11).
4310 19	5/2+	3145 12	E(p)(lab): weighted average of 3158 18 (1998Bh12), 3139 12 (1997Ho12), 3148 20 (1974Se11).
4506 13	3/2+	3337 13	E(p)(lab): weighted average of 3352 15 (1998Bh12), 3295 40 (1998Li46), 3330 13 (1997Ho12), 3339 30 (1974Se11).
4656 12	(1/2, 3/2, 5/2)+	3483 12	E(p)(lab): weighted average of 3488 16 (1998Bh12), 3452 70 (1998Li46), 3480 12 (1997Ho12), 3487 20 (1974Se11).
4776 6	3/2+	3600 6	E(p)(lab): weighted average of 3604 11 (1998Bh12), 3569 40 (1998Li46), 3598 6 (1997Ho12), 3605 15 (1974Se11).
4869 5	5/2+	3691 5	E(p)(lab): weighted average of 3691 10 (1998Bh12), 3647 50 (1998Li46), 3691 5 (1997Ho12), 3690 15 (1974Se11).
4929 5	5/2+	3749 5	E(p)(lab): weighted average of 3751 8 (1998Bh12), 3749 18 (1998Li46), 3749 5 (1997Ho12), 3749 10 (1974Se11).
5007 9	1/2+	3825 9	E(p)(lab): weighted average of 3803 18 (1998Bh12), 3857 40 (1998Li46), 3837 9 (1997Ho12), 3836 25 (1974Se11).
5067 11	3/2+	3884 11	E(p)(lab): weighted average of 3870 15 (1998Bh12), 3888 11 (1997Ho12), 3904 25 (1974Se11). Other: 4025 40 (1998Li46).
5379 6	5/2+	4188 6	E(p)(lab): weighted average of 4185 8 (1998Bh12), 4192 20 (1998Li46), 4189 6 (1997Ho12), 4187 15 (1974Se11).
5496 13	1/2+	4302 13	E(p)(lab): weighted average of 4323 32 (1998Bh12) and 4298 13 (1997Ho12).
5581 8	3/2+	4385 8	E(p)(lab): weighted average of 4397 11 (1998Bh12), 4376 40 (1998Li46), 4381 8 (1997Ho12), 4379 15 (1974Se11).
5767 6	5/2+	4570 8	E(p)(lab): weighted average of 4586 15 (1998Bh12), 4567 8 (1997Ho12), 4564 20 (1974Se11). Other: 4486 40 (1998Li46). Feeding to the 3904, 2+ in ⁴⁰ Ca gives E(p)=750 11, weighted average of 698 45 (1998Bh12), 754 12 (1997Ho12), 744 60 (1998Li46).
5840 5	5/2+	4638 5	E(p)(lab): weighted average of 4634 8 (1998Bh12), 4625 66 (1998Li46), 4639 5 (1997Ho12), 4638 10 (1974Se11).
5885 11	5/2+	4682 11	E(p)(lab): weighted average of 4666 36 (1998Bh12) and 4684 11 (1997Ho12).
5940 4	3/2+	4735 4	T=3/2. E(p)(lab): weighted average of 4736 8 (1998Bh12), 4727 16 (1998Li46), 4736 5 (1997Ho12), 4734 4 (1974Se11).
6036 11	1/2+	4829 11	E(p)(lab): weighted average of 4829 11 (1998Bh12) and 4832 25 (1974Se11).
6085 20	(1/2, 3/2, 5/2)+	4877 20	E(p)(lab): weighted average of 4877 36 (1998Bh12), 4883 60 (1998Li46), 4876 20 (1974Se11).
6102? 15		1249 [#] 15	E(p)(lab): from 1974Se11. This level may be the same as the 6085 level.
6156 14	5/2+	4946 14	E(p)(lab): weighted average of 4949 14 (1998Bh12), 4976 40 (1998Li46), 4925 25 (1974Se11).
6305? 40	(1/2, 3/2, 5/2)+	5093 [@] 40	E(level): 6305 40 from E(p)=5093 40 to ⁴⁰ Ca g.s. and 6293 70 from E(p)=1272 70 to 3904, 2+ ⁴⁰ Ca (1998Li46).
6380 17	5/2+	5168 17	E(p)(lab): weighted average of 5165 17 (1998Bh12) and 5177 30 (1974Se11).
6435 40	5/2+	5219 40	E(p)(lab): from 1998Li46.
6468? 12	(1/2, 3/2, 5/2)+	1981 ^{&} 12	E(p)(lab): weighted average of 1983 25 (1974Se11) and 1981 12 (1997Ho12). E(level): this level may be the same as the 6435-keV level.
6560? 60	5/2+	5364 60	E(p)(lab): from 1998Li46.
6673 40	(1/2, 3/2, 5/2)+	5451 40	E(p)(lab): from 1998Li46.
6829 21	5/2+	5603 21	E(p)(lab): weighted average of 5658 40 (1998Li46) and 5595 15 (1985Zh05).
6877 40	(1/2, 3/2, 5/2)+	1842 [@] 40	E(p)(lab): from 1998Li46.
6947 15	(1/2, 3/2, 5/2)+	5718 15	E(level): also possibly 6936 30 (1974Se11) from E(p)=2063 30 to 3737 state in ⁴⁰ Ca. E(p)(lab): weighted average of 5736 40 (1998Li46) and 5715 15 (1985Zh05).
7021? 60		1987 [@] 60	E(p)(lab): from 1998Li46.
7182 20	(1/2, 3/2, 5/2)+	5947 20	E(level): also possibly 7153 42 from E(p)=2111 42 (1998Li46). E(p)(lab): weighted average of 5889 94 (1998Li46) and 5950 20 (1985Zh05).
7360 20	(1/2, 3/2, 5/2)+	6121 20	E(p)(lab): weighted average of 6082 60 (1998Li46) and 6125 20 (1985Zh05).
7620 50	(1/2, 3/2, 5/2)+	6370 50	E(p)(lab): weighted average of 6359 60 (1998Li46) and 6380 50 (1985Zh05).
7900 50	(1/2, 3/2, 5/2)+	6680 50	E(p)(lab): weighted average of 6725 60 (1998Li46) and 6650 50 (1985Zh05).

[†] E(p)(c.m.)+S(p)(⁴¹Sc)+E(⁴⁰Ca). S(p)=1085.00 8 (2012Wa38).

[‡] Values are in keV.

[§] From the Adopted Levels.

⁴¹Ti ϵ Decay (81.9 ms) 1997Ho12,1998Li46,1998Bh12 (continued)

⁴¹Sc Levels (continued)

This proton group feeds the 3737 state in ⁴⁰Ca.

@ This proton group feeds the 3904, 2+ state in ⁴⁰Ca.

& This proton group feeds the 3353 state in ⁴⁰Ca.

 β^+, ϵ Data

E ϵ	E(level)	I β^+	I ϵ^+	Log <i>ft</i>	I($\epsilon+\beta^+$)	Comments
(5040 60)	7900	0.051 5	0.00014 2	5.26 6	0.051 5	I($\epsilon+\beta^+$): weighted average of 0.078 26 (1998Li46) and 0.050 5 (1985Zh05).
(5320 60)	7620	0.053 12	0.00012 3	5.37 11	0.053 12	I($\epsilon+\beta^+$): weighted average of 0.10 3 (1998Li46) and 0.050 8 (1985Zh05).
(5580 40)	7360	0.074 9	0.00014 2	5.35 6	0.074 9	I($\epsilon+\beta^+$): weighted average of 0.16 5 (1998Li46) and 0.073 5 (1985Zh05).
(5760 40)	7182	0.103 17	0.00018 3	5.28 8	0.103 17	I($\epsilon+\beta^+$): weighted average of 0.21 5 (1998Li46) and 0.100 8 (1985Zh05).
(5920 $\frac{1}{2}$ 70)	7021?	1.4 3	0.0022 5	4.21 10	1.4 3	I($\epsilon+\beta^+$): from 1985Zh05. Other: 0.29 4 (1998Li46).
(5990 40)	6947	0.094 8	0.00014 1	5.42 4	0.094 8	
(6060 50)	6877	0.8 3		4.51 17	0.8 3	I($\epsilon+\beta^+$): from 1998Li46.
(6110 40)	6829	0.065 8	9.0 $\times 10^{-5}$ 11	5.62 6	0.065 8	I($\epsilon+\beta^+$): from 1985Zh05. Other: 0.8 4 (1998Li46).
(6270 50)	6673	0.63 13	0.00079 17	4.70 10	0.63 13	I($\epsilon+\beta^+$): from 1998Li46.
(6380 70)	6560?	0.39 21	0.00046 25	4.95 24	0.39 21	I($\epsilon+\beta^+$): from 1998Li46.
(6470 40)	6468?	0.7 2	0.0008 2	4.73 13	0.7 2	I($\epsilon+\beta^+$): weighted average of 0.7 2 (1997Ho12) and 0.75 15 (1974Se11).
(6510 50)	6435	0.68 13	0.00075 15	4.75 9	0.68 13	I($\epsilon+\beta^+$): from 1998Li46.
(6560 40)	6380	0.38 16	0.00041 17	5.03 19	0.38 16	I($\epsilon+\beta^+$): weighted average of 1.5 5 (1998Bh12), 0.36 7 (1974Se11).
(6640 $\frac{1}{2}$ 50)	6305?	1.9 6	0.0020 6	4.36 14	1.9 6	I($\epsilon+\beta^+$): from 0.55 39 from E(p)=5093 40 to ⁴⁰ Ca g.s. and 1.3 4 from E(p)=1272 70 to 3904, 2+ ⁴⁰ Ca (1998Li46).
(6780 40)	6156	0.73 12		4.82 8	0.73 12	I($\epsilon+\beta^+$): weighted average of 1.9 5 (1998Bh12), 0.94 44 (1998Li46), 0.70 7 (1974Se11).
(6840 $\frac{1}{2}$ 40)	6102?	0.95 22		4.73 11	0.95 22	I($\epsilon+\beta^+$): from 1974Se11.
(6860 40)	6085	0.83 10		4.79 6	0.83 10	I($\epsilon+\beta^+$): weighted average of 1.0 3 (1998Bh12), 0.63 31 (1998Li46), 0.83 10 (1974Se11).
(6900 40)	6036	0.8 3		4.83 17	0.8 3	I($\epsilon+\beta^+$): weighted average of 3.3 7 (1998Bh12) and 0.73 7 (1974Se11).
(7000 30)	5940	25.0 6	0.0214 6	3.364 15	25.0 6	I($\epsilon+\beta^+$): weighted average of 26.6 11 (1998Bh12), 27.9 29 (1998Li46), 26.1 10 (1997Ho12), 24.3 5 (1974Se11).
(7060 40)	5885	1.1 2		4.74 8	1.1 2	I($\epsilon+\beta^+$): weighted average of 1.2 3 (1998Bh12) and 1.1 2 (1997Ho12).
(7100 30)	5840	5.3 3	0.0043 3	4.07 3	5.3 3	I($\epsilon+\beta^+$): weighted average of 3.9 8 (1998Bh12), 5.0 4 (1997Ho12), 5.4 2 (1974Se11). Other: 1.6 11 (1998Li46).
(7170 30)	5767	0.61 11		5.03 8	0.61 11	I($\epsilon+\beta^+$): weighted average of 0.7 2 (1998Bh12), 1.3 5 (1998Li46), 1.14 22 (1997Ho12), 0.53 7 (1974Se11).
(7360 40)	5581	1.75 10	0.00126 8	4.64 3	1.75 10	I($\epsilon+\beta^+$): weighted average of 1.4 2 (1998Bh12), 2.4 5 (1998Li46), 0.6 2 (1997Ho12), 1.75 10 (1974Se11).
(7440 40)	5496	0.36 12		5.35 15	0.36 12	I($\epsilon+\beta^+$): weighted average of 0.4 2 (1998Bh12) and 0.34 13 (1997Ho12).
(7560 30)	5379	3.73 12	0.00245 9	4.373 18	3.73 12	I($\epsilon+\beta^+$): weighted average of 3.8 2 (1998Bh12), 3.3 7 (1998Li46), 3.4 4 (1997Ho12), 3.74 12 (1974Se11).
(7870 40)	5067	0.42 8		5.42 9	0.42 8	I($\epsilon+\beta^+$): weighted average of 0.9 2 (1998Bh12), 0.5 20 (1998Li46), 0.84 20 (1997Ho12), 0.36 5 (1974Se11).

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⁴¹Ti ε Decay (81.9 ms) 1997Ho12,1998Li46,1998Bh12 (continued)

β⁺,ε Data (continued)

Eε	E(level)	Iβ ⁺ †	Iε†	Log ft	I(ε+β ⁺)†	Comments
(7930 40)	5007	0.61 6		5.27 5	0.61 6	I(ε+β ⁺): weighted average of 1.0 3 (1998Bh12), 0.5 3 (1998Li46), 0.9 2 (1997Ho12), 0.58 5 (1974Se11).
(8010 30)	4929	7.6 5	0.0041 3	4.20 3	7.6 5	I(ε+β ⁺): weighted average of 6.7 6 (1998Bh12), 10.2 10 (1998Li46), 7.6 5 (1997Ho12), 7.5 5 (1974Se11).
(8070 30)	4869	3.6 5	0.0019 3	4.54 7	3.6 5	I(ε+β ⁺): weighted average of 3.3 6 (1998Bh12), 1.4 5 (1998Li46), 4.7 4 (1997Ho12), 3.77 19 (1974Se11).
(8160 30)	4776	2.1 3	0.0011 2	4.80 7	2.1 3	I(ε+β ⁺): weighted average of 1.5 2 (1998Bh12), 1.3 5 (1998Li46), 1.9 3 (1997Ho12), 2.36 10 (1974Se11).
(8280 40)	4656	0.65 7		5.35 5	0.65 7	I(ε+β ⁺): weighted average of 0.7 2 (1998Bh12), 1.0 5 (1998Li46), 0.54 14 (1997Ho12), 0.68 10 (1974Se11).
(8430 40)	4506	0.62 8		5.41 6	0.62 8	I(ε+β ⁺): weighted average of 0.8 2 (1998Bh12), 0.9 4 (1998Li46), 0.60 15 (1997Ho12), 0.56 10 (1974Se11).
(8630 40)	4310	0.84 16		5.33 9	0.84 16	I(ε+β ⁺): weighted average of 1.5 6 (1998Bh12), 0.7 2 (1997Ho12), 0.97 27 (1974Se11).
(8690 30)	4247	16.3 6	0.0067 3	4.059 19	16.3 6	I(ε+β ⁺): weighted average of 16.5 8 (1998Bh12), 17.6 19 (1998Li46), 17.1 8 (1997Ho12), 14.7 9 (1974Se11).
(8980 40)	3959	0.9 2		5.39 10	0.9 2	I(ε+β ⁺): weighted average of 0.6 2 (1998Bh12), 1.3 4 (1998Li46), 0.54 16 (1997Ho12), 1.19 12 (1974Se11).
(9130 40)	3808	1.5 3		5.21 9	1.5 3	I(ε+β ⁺): weighted average of 0.8 2 (1998Bh12), 1.9 8 (1998Li46), 1.8 3 (1997Ho12), 1.97 19 (1974Se11).
(9250 140)	3690	0.65 13		5.60 10	0.65 13	I(ε+β ⁺): from 1998Li46.
(9380 30)	3560	2.4 2		5.07 4	2.4 2	I(ε+β ⁺): weighted average of 2.5 2 (1998Bh12), 1.9 14 (1998Li46), 2.2 3 (1997Ho12): Other: 3.57 7 (1974Se11), not included in average since value includes correction for ⁴⁰ Sc component.
(9530 30)	3414	5.0 6	0.0015 2	4.78 6	5.0 6	I(ε+β ⁺): weighted average of 4.1 2 (1998Bh12), 5.5 15 (1998Li46), 4.7 5 (1997Ho12), 6.33 24 (1974Se11).
(10230 40)	2712	0.52 24		5.93 20	0.52 24	I(ε+β ⁺): weighted average of 0.4 1 (1998Bh12) and 1.0 2 (1997Ho12).
(10270 30)	2666	4.1 9		5.04 10	4.1 9	I(ε+β ⁺): weighted average of 2.3 2 (1998Bh12), 5.4 5 (1998Li46), 7.5 6 (1997Ho12), 5.24 19 (1974Se11).
(10850 30)	2095	5.3 3	0.0010 1	5.06 3	5.3 3	I(ε+β ⁺): weighted average of 5.3 3 (1998Bh12), 6.3 17 (1998Li46), and 5.1 5 (1997Ho12). Other: 9.4 6 (1974Se11), not included in average since value includes correction for ⁴⁰ Sc component.

† Absolute intensity per 100 decays.

‡ Existence of this branch is questionable.

⁴³Cr ε2p Decay (21.2 ms) 2012Au08,2011Po01,2007Do17

Parent ⁴³Cr: E=0.0; Jπ=(3/2+); T_{1/2}=21.2 ms 7; Q(g.s.)=11770 syst; %ε2p decay=11.6 10.

⁴³Cr-Q(ε): deduced by evaluators from Q(β⁺) for ⁴³Cr=15620 syst 400 and S(2p) for ⁴³V=3850 40, with both values from 2012Wa38.

⁴³Cr-%ε2p decay: %ε2p=11.6 10 (2012Au08) deduced by authors from relative β2p branching 12.7 % 10 (2012Au08) and total proton branching 91.0% 23 (weighted average of 92.5% 28 (2007Do17) and 88% 4 (2011Po01). Others: 7.1 4 (2011Po01), 6 5 (1992Bo37).

2012Au08: ⁴³Cr activity from fragmentation of ⁵⁸Ni beam with E=75 MeV/nucleon on a natural Ni target. Ions separated with the LISE3 spectrometer and identified through measurements of magnetic rigidity, energy loss and velocity using two silicon detectors and micro-channel plate detectors. Measured %branching and energy sharing between the two proton emission using a time projection chamber.

2011Po01: ⁴³Cr activity from fragmentation of ⁵⁸Ni beam with E=161 MeV/nucleon on a natural Ni target. Products selected with the A1900 fragment separator and identified through time-of-flight and energy loss measurements.

Measured two proton decay, %branching using an optical time projection chamber.

Others: 2007Do17, 2001Gi01 (also 2001Gi02), 1992Bo37.

Total energy of the emitted two protons has been measured as 4246 15 (2007Do17) and 4292 22 (2001Gi01).

2012Au08 find a ratio of 34%-66% of the total energy for each proton and an isotopic distribution for the relative angle between the two emitted protons. Both of these results support a sequential emission of protons via intermediate states in ⁴²Ti.

⁴¹Sc Levels

E(level)	Jπ [†]	T _{1/2} [†]
0.0	7/2-	596.3 ms 17

[†] From the Adopted Levels.

⁴⁰Ca(p,γ) 1987Zi02,1968Yo04

2014Sc05: E(p)=1840-1847 keV. Measured yield function and γ(θ) for 2882γ from 2882-keV level. Deduced resonance strength using absolute strength measurement and relative to the resonance triplet at E(α)=4.5 MeV in the ⁴⁰Ca(α,γ) reaction.

1987Zi02: E(p)=640-3500 keV. Measured Eγ, Iγ, γ(θ), yield function using two HPGe detectors and two Ge(Li) detectors (one with Compton-suppression). Deduce resonance strengths.

1983Te02: E(p)=2100 - 3100 keV. Measured Eγ, Iγ, γ(θ), direct capture cross sections to g.s. and 1716 state using two Ge(Li) detectors.

1979Pa16 (also 1980PaZP): E(p)=500-2000 keV. Measured Eγ, Iγ using a Ge(Li) detector; deduced resonance strength of 2882-keV level.

1977Ko10: E(p)=1843 keV and 4051 keV. Measured Eγ, Iγ, γ(θ), γ(lin pol) using two Ge(Li) detectors and excitation functions using a NaI(Tl) detector.

1968Yo04 (also 1965Yo03,1965Yo02): E(p)=648-5191 keV. Measured γ widths and γ(θ) for g.s. transitions by determining the positron activity of ⁴¹Sc using a β-ray spectrometer consisting of two nested plastic scintillators. Also measured Eγ, Iγ, γ(θ) using two cylindrical NaI(Tl) crystals. T_{1/2} of 1716 state measured in 1965Yo03.

1982McZV: E(p)=6035-7405. 7 states reported. Deduced upper limits on E1 and M1 strengths to g.s.

1976Fo01: E(p)=4971 - 4979 keV. Measured Eγ, Iγ, γ(θ), excitation function for 5937-keV level using a Ge(Li) detector.

1971ClZR: E(p)=4.8-12.5 MeV. Deduced resonances.

1966En04: E(p)=1842 keV. Measured yield function using NaI detector; deduced resonance strength of 2282-keV level.

Others: 2012Ro13, 1961Bu08.

⁴¹Sc Levels

E(level) [†]	Jπ [‡]	Γ [§]	E(p)(lab) [#]	(2J+1)Γ _p Γ _γ /Γ [@]	Comments
0.0	7/2-				Jπ: from the Adopted Levels.
1716.48 8	3/2-		647.28	0.0018	%p>98; %IT<2 (1987Zi02). E(level): from Eγ and E(p) (1987Zi02). Radiative T _{1/2} =0.36 ps 11 from Γ _γ =0.0013 eV 4 (1965Yo03). Other: 0.30 ps from Γ _γ =0.02 eV-b (1961Bu08).
2096.0 5	3/2		1036.3		C ² S=1.0 3 relative to 1.0 for g.s. (1983Te02). %p>99; %IT<1 (1987Zi02). Jπ: from γ(θ) in 1987Zi02.

Continued on next page (footnotes at end of table)

⁴⁰Ca(p,γ) 1987Zi02,1968Yo04 (continued)

⁴¹Sc Levels (continued)

E(level) [†]	Jπ [‡]	Γ [§]	E(p)(lab) [#]	(2J+1)Γ _p Γ _γ /Γ [@]	Comments
2414.9 5	not 1/2-		1363.2		%p>50; %IT<50 (1987Zi02).
2588.30 7	5/2-		1540.87	0.020 3	Jπ: from γ(θ) in 1987Zi02. %p>90; %IT<10 (1987Zi02).
2666.84 7	5/2+		1621.39	0.018 2	Jπ: from γ(θ) and RUL (1968Yo04). J=9/2 also possible from γ(θ). %p>98; %IT<2 (1987Zi02).
2719.38 9			1675.24	0.004 1	Jπ: from γ(θ) and RUL (1968Yo04). J=3/2,9/2 also possible from γ(θ).
2882.47 8	7/2+		1842.66	0.384 34	%IT=41 2; %p=59 2 (1987Zi02).
					Jπ: 7/2 from γ(θ) in 1977Ko10; E1(+M2) 2282γ to 7/2- from γ(lin pol) gives π=+.
					(2J+1)Γ _p Γ _γ /Γ: from 2014Sc05 measured both absolute and relative to the ⁴⁰ Ca(α,γ) reaction. Others: 0.28 4 (2012Ro13), 0.28 5 (1979Pa16), 0.28 4 (1977Ko10), 0.39 9 (1968Yo04), 0.26 4 (1966En04), 0.30 +30-16 (1961Bu08).
2972.3 2	7/2-		1934.5	0.062 8	Jπ: from γ(θ) and RUL (1968Yo04). J=9/2 also possible from γ(θ).
3014 4			1977		%p>99; %IT<1 (1987Zi02).
3185.4 2	(5/2-, 9/2+)		2152.9	0.20 3	%p>92; %IT<8 (1987Zi02).
3358.1 7	(11/2+)				Jπ: from γ(θ) and RUL (1968Yo04).
3411.8 4	1/2+		2385.0	0.012 4	E(level): seen in γ decay from 5037 level. Jπ: Jπ>5/2 from γ(θ) in 1977Ko10.
3470 5	1/2-		2445	0.11 7	Jπ: from 1983Te02.
3563.0 3			2540.0	0.023 5	(2J+1)Γ _p Γ _γ /Γ: other: 0.006 4 (1983Te02).
3678 3				0.007	Jπ,E(p)(lab),(2J+1)Γ _p Γ _γ /Γ: from 1983Te02.
3697.1 3	7/2+		2677.4	0.30 4	
3775 4	3/2-		2755		Jπ: from γ(θ) and RUL (1987Zi02).
3781.2 2	(5/2+)		2763.5	0.110 15	Jπ: other: 7/2- favored by RUL in 1968Yo04.
3969	1/2+		2957	0.016 6	
4023.3 4	7/2-		3011.7	0.077 11	Jπ,E(p)(lab),(2J+1)Γ _p Γ _γ /Γ: from 1983Te02.
4030.7 6	7/2-		3019.3	0.091 14	Jπ: from γ(θ) and RUL in 1968Yo04.
4245 4	5/2+		3240	1.00	Jπ: from γ(θ) and RUL (1987Zi02).
4328 4			3325	0.14	
4441 4	(5/2-, 7/2-)		3440	0.17	Jπ: from γ(θ) and RUL in 1968Yo04.
4514 4	5/2-, 9/2+		3515	0.36	Jπ: from γ(θ) and RUL in 1968Yo04.
4810 3	(5/2-, 7/2-, 9/2+)		3819	0.41	Jπ: from γ(θ) and RUL in 1968Yo04.
4871 6	5/2+		3881	0.030	
4953 5	5/2-	2.4 keV 6	3965	0.38	Jπ: from γ(θ) and RUL (1987Zi02).
					Jπ: other: 7/2- favored by RUL in 1968Yo04.
5011 3	7/2-		4025	0.74	
5037.5 14	9/2+		4051.2	2.40 4	Jπ: from γ(θ) and RUL in 1968Yo04.
					E(p)(lab),(2J+1)Γ _p Γ _γ /Γ: from 1977Ko10. Other: E(p)=4054 (1968Yo04).
5143 9	(3/2-)		4160	0.014	
5167 5			4185	1.20	
5200 7			4219	0.060	
5225 9			4244	0.030	
5324 7			4346	0.150	
5379 9	(5/2+)	9.5 keV 30	4402	0.320	
5524 7			4551	0.57	
5537 9			4564	0.095	
5568 9			4596	0.18	
5574 10	(5/2+)		4602	0.12	
5653 7	(5/2-, 7/2-)		4683	0.35	
5694 10			4724	0.060	
5710 10	(5/2-, 7/2-)	11.5 keV 30	4741	1.40	
5717 10			4748	0.20	

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{p},\gamma)$ 1987Zi02,1968Yo04 (continued) **^{41}Sc Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	$\Gamma^{\S}$	E(p)(lab) [#]	$(2J+1)\Gamma_{\text{p}}\Gamma_{\gamma}/\Gamma^{\textcircled{a}}$	Comments
5773 4			4806	0.90	E(p)(lab): from 1976Fo01. E(p)=4812 8 (1968Yo04).
5801 8			4835	0.12	
5810 4			4843	0.35	E(p)(lab): from 1976Fo01. E(p)=4850 8 (1968Yo04).
5859 11	(3/2-)		4894	0.11	
5872 11	(5/2-, 7/2-)	9.4 keV 20	4907	1.30	
5915 11			4952	0.15	
5937 5	(3/2+, 5/2+)		4974	0.50 9	E(p)(lab), (2J+1) $\Gamma_{\text{p}}\Gamma_{\gamma}/\Gamma$: from 1976Fo01. J π : 3/2+ in the Adopted Levels. T=3/2 (1976Fo01). E(p)(lab): 4974 4 (1976Fo01).
5973 11	(5/2-, 7/2-)	4.2 keV 20	5011		
6058 11		3.9 keV 10	5098		
6086 11			5127		
6112 11			5154		
6116 11			5158		
6149 11	(5/2+)		5191		

[†] From E(p)(c.m.)+S(p)(^{41}Sc) with S(p)(^{41}Sc)=1085.00 8 (2012Wa38).[‡] From $\text{p}\gamma(\theta)$ data of 1987Zi02 and 1968Yo04, except where noted. Additional support for J π assignments provided in the comments.[§] From 1968Yo04.[#] Values are in keV, from 1987Zi02 up to 4 MeV, from 1968Yo04 above this energy, except where noted. The uncertainty is about the same as in the excitation energy.[@] Values are in keV, from 1987Zi02 up to 4 MeV, from 1968Yo04 above this energy, except where noted. **$\gamma(^{41}\text{Sc})$**

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\ddagger}$	Mult. [§]	$\delta^{\S}$	$\Gamma_{\gamma}^{\textcircled{a}}$	Comments
1716.48	1716.4	100			0.0013 4	Γ_{γ} : from 1965Yo03.
2414.9	319	<8				
	698	100				
	2414	<5				
2588.30	492	<0.3				
	872	2.4 3				
	2588	97.6 3	D+Q	+1.2 +11-6	0.0043	Mult., δ : from $A_2=-1.02$ 9, $A_4=+0.12$ 17 (1968Yo04).
2666.84	571	<0.6				
	950	4.2 8				
	2667	95.8 8	D(+Q)	0.07 +14-7	0.0070	Mult., δ : from $A_2=-0.30$ 14, $A_4=+0.39$ 24 (1968Yo04).
2719.38	623	<5				
	1003	100				
	2719	<7				
2882.47	786	0.08 3				
	2883.1 5	99.92 3	E1(+M2)	+0.05 5	0.048	E_{γ} : from 1977Ko10. Mult.: from $A_2=+0.52$ 3, $A_4=-0.06$ 5, POL=+0.12 3 (1977Ko10). δ : from 1977Ko10. Other: 0.04 +12-4 (1968Yo04).
2972.3	876	<0.2				
	2972	100	D(+Q)	0.5 +5-4	0.010	Mult., δ : from $A_2=+0.72$ 8, $A_4=-0.11$ 13 (1968Yo04).
3014	917	87 5				
	3013	13 5				
3185.4	466	<0.3				
	597	<0.2				
	770	<0.2				
	1089	<0.2				
	3185	100	D+Q	+0.18 +4-5	0.044	δ, Γ_{γ} : for 5/2; $\delta=0.035$ +17-35 and $\Gamma_{\gamma}=0.026$ eV for J=9/2 (1968Yo04). Mult., δ : from $A_2=-0.395$ 17, $A_4=+0.02$ 3 (1968Yo04).
3411.8	529	<3				

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(\text{p},\gamma)$ 1987Zi02,1968Yo04 (continued)

 $\gamma(^{41}\text{Sc})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\ddagger}$	Mult. [§]	$\delta^{\S}$	$\Gamma_{\gamma}^{\text{a}}$	Comments
3411.8	692	<3				
	745	<3				
	823	<2				
	997	<3				
	1695	100				
	3411	<2				
3470	1759	100				
	3475	<4				
3563.0	1846	100				
	3563	<13				
3678	1961	36 12				
	3678	64 12				
3697.1	684	<0.1				
	814	3.1 4				
	1030	4.1 2	D+Q	0.26 18		Mult., δ : from $A_2=-0.9$ 3, $A_4=+0.5$ 5 (1987Zi02).
	1109	<0.1				
	1282	<0.1				
	1601	1.0 1				
	3697	91.8 4	D(+Q)	0.06 10	0.070	Mult., δ : from $A_2=+0.44$ 4, $A_4=-0.10$ 4 (1987Zi02). Other: $A_2=+0.54$ 3, $A_4=-0.01$ 5, $\delta=0.07$ +71-7 (1968Yo04).
3775	3775	100	D(+Q)	0.00 11	0.025	Mult., δ : from $A_2=-0.14$ 5, $A_4=-0.03$ 8 (1968Yo04).
3781.2	768	1 1				
	898	2 1				
	1062	1 1				
	1114	6 1				
	1193	1 1				
	1685	2 1				
	2064	20 1				
	3781	67 3				
	4023.3	<0.7				
	1304	<0.5				
4023.3	1356	24 1				
	1434	2.0 5				
	1927	0.5 5				
	2306	2.3 6				
	4023	71 1	D+Q	+1.1 4	0.016	Mult., δ : $A_2=+0.506$ 15, $A_4=-0.332$ 22 (1968Yo04).
4030.7	1148	<0.4				
	1442	<0.3				
	1934	<0.2				
	2314	2.0 6				
	4030	98.0 6	D+Q	-1.14 15	0.025	Mult., δ : from $A_2=+0.46$ 4, $A_4=-0.27$ 4 (1987Zi02). Other: $A_2=+0.45$ 4, $A_4=-0.02$ 5, $\delta=0.05$ +120-5 (1968Yo04).
4245	1232	15 1				
	1363	11.7 6				
	1526	<0.1				
	1578	4.3 3	D+Q	+0.14 9		Mult., δ : from $A_2=+0.36$ 7, $A_4=-0.21$ 9 (1987Zi02). Other: $\delta=-1.8$ 3 is alternative solution to $\gamma(0)$ (1987Zi02).
	1657	0.4 1				
	1830	0.6 2				
	2149	51 1	D+Q	0.06 2		Mult., δ : $A_2=-0.54$ 2, $A_4=+0.02$ 2 (1987Zi02).
	2529	0.2 2				
	4245	16.8 5	D(+Q)	0.03 5	0.051	Mult., δ : from $A_2=-0.10$ 4, $A_4=+0.01$ 5 (1987Zi02). Other: +0.035 +110-35 (1968Yo04).
4328	1661	<1				
	1740	18.5 14				
	1913	<0.9				
	2232	<0.6				
	4328	81.5 14				
4441	1255	21.0 15				
	1558	8 2				

Continued on next page (footnotes at end of table)

⁴⁰Ca(p,γ) 1987Zi02,1968Yo04 (continued)

γ(⁴¹Sc) (continued)

E(level)	Eγ [†]	Iγ [‡]	Mult. [§]	δ [§]	Γ _γ ^a	Comments
4441	1721	<0.7				
	1773	32.4 17				
	1852	<0.7				
	4440	38.6 18				
4514	4514&		D+Q		0.083	A ₂ =+0.48 23, A ₄ =+0.41 34 (1968Yo04). Mult.: from A ₂ =-0.394 24, A ₄ =+0.013 23 (1968Yo04). δ,Γ _γ : δ=0.16 +5-4 and Γ _γ = 0.083 eV for J=5/2 and δ=0.035 +18-35 and Γ _γ =0.050 eV for J=9/2 (1968Yo04).
4810	4810&		D+Q	0.17 12	0.093	Mult.,δ: from A ₂ =-0.408 23, A ₄ =+0.03 3 (1968Yo04). δ,Γ _γ : for J=5/2; δ=0.035 +9-35 and I(γ+ce)=0.056 eV for J=9/2 (1968Yo04).
4871	4871				0.007	
4953	4953		D+Q	+0.25 9	0.088	Mult.,δ: from A ₂ =-0.51 8, A ₄ =+0.01 10 (1968Yo04).
5011	5011&		D+Q	0.81 16	0.13	Mult.,δ: from A ₂ =+0.56 4, A ₄ =-0.16 5 (1968Yo04).
5037.5	1678.8# 5	2.7# 5				A ₂ =-0.17 18, A ₄ =+0.07 19 (1977Ko10).
	2153.9# 5	26# 2	D+Q	+0.017 +22-7		Mult.,δ: from A ₂ =-0.27 4, A ₄ =-0.02 4 (1977Ko10).
	5036.9# 5	72# 2	D+Q	+0.017 +8-15	0.33	Mult.,δ: from A ₂ =-0.28 4, A ₄ =-0.03 4 (1977Ko10). δ: from 1977Ko10. Other:+0.035 +260-35 (1968Yo04).
5143	5143				0.005	
5379	5379				0.072	
5574	5574				0.028	
5653	5653				0.081	Γ _γ : for J=5/2; 0.061 eV for J=7/2 (1968Yo04).
5710	5710				0.314	Γ _γ : for J=5/2; 0.236 eV for J=7/2 (1968Yo04).
5859	5859				0.036	
5872	5872				0.308	Γ _γ : for J=5/2; 0.231 eV for J=7/2 (1968Yo04).
5937	1690.4@ 8	60@ 3	D(+Q)@	-0.04 8		δ: or -3.7 10 for J=3/2; δ=-0.40 6 for J=5/2 (1976Fo01). Mult.: A ₂ =-0.04 2 (1976Fo01).
	2161.0@ 15	5@ 3				
	2523.0@ 24	18@ 3				
	3270.4@ 15	17@ 2	D+Q@	-0.41 16		δ: or -1.5 4 for J=3/2; δ=-0.13 23 for J=5/2 (1976Fo01). Mult.: A ₂ =+0.27 21 (1976Fo01).
	3843@b	<13@				
5973	5973				0.092	Γ _γ : for J=5/2; 0.069 eV for J=7/2 (1968Yo04).
6149	6149				0.19	

[†] From level-energy differences, rounded off to nearest keV, except where noted.

[‡] Relative branching ratios from 1987Zi02, except where noted.

[§] From γ(0). Angular distribution coefficients provided in the comments.

From 1977Ko10.

@ From 1976Fo11. Multipolarities from γ(0) measurements.

& From 1968Yo04.

^a In eV from 1968Yo04, except where noted.

^b Placement of transition in the level scheme is uncertain.

$^{40}\text{Ca}(p,\gamma)$ 1987Zi02,1968Yo04 (continued)

Level Scheme

Intensities: % photon branching from each level

$^{40}\text{Ca}(\text{p},\gamma)$ 1987Zi02,1968Yo04 (continued)

Level Scheme (continued)

Intensities: % photon branching from each level

⁴⁰Ca(p,p),(p,p'): Res 1980Wa11,1975Ko13,1974Mi16

Other main references: 1974Wi09, 1974Ve11, 1974Tr06, 1973Ta26, 1972Kl03, 1971Kl03, 1970Ma16, 1969Ma08, 1970Lo18. Most references deal with (p,p) data. The following also have (p,p') data: 1970Ma16, 1970Wh06, 1973Ta26, 1974Mi16, 1973Ta26, 1980Al13, 1980Wa11, 1982Wa12. 1982Wa12,1980Wa11: E=5.9–6.5 MeV. Measured $\sigma(\theta)$, $\text{pol}(\theta)$ using pairs of symmetrically located surface barrier detectors. 1975Ko13: E=2.35–4.85 MeV. Measured $\sigma(E, \theta)$ using four surface barrier detectors. 1974Mi16 (also 1974MiYW): E=4.8–8.2 MeV. Measured $\sigma(E, \theta)$ using silicon surface barrier detectors. 1974Wi09: E=1.8–2.9 MeV. Measured σ using surface barrier detectors. 1974Ve11: E=1.2–4.4 MeV. Measured $\sigma(\theta)$. 1974Tr06: E=4.97 MeV, polarized protons. Measured σ , A_y for 5941-keV level. 1973Ta26: E=7–11 MeV, Measured $\sigma(E)$ for inelastic scattering to the 5.613 MeV, 4- state of ⁴⁰Ca from measurements of the associated gamma decay with a Ge(Li) detector. Also measured $\sigma(\theta)$ using a magnetic spectrometer. 1972Kl03: E=2.3–2.8 MeV, polarized protons. Measured proton polarization, deduced $J\pi$ of 3465, 3480, 3732 and 3774 keV levels. 1971Kl03: E=2.68–2.76 MeV. Measured polarization. 1970Ma16,1969Ma08: E=4.8–6.2. Measured σ using three 1 mm thick silicon surface barrier detectors. 1970Lo18: E=2.3–2.8. Measured σ .

⁴¹Sc Levels

For inelastic proton scattering data given under comments, the following nomenclature is used for A_2 , A_4 , L-values, spins and partial widths:

$A_2(1)$, $A_4(1)$, L(1), J(1) and $\Gamma(1)$ for scattering to 3352, 0+ state in ⁴⁰Ca.
 $A_2(2)$, $A_4(2)$, L(2), J(2) and $\Gamma(2)$ for scattering to 3737, 3- state in ⁴⁰Ca.
 $A_2(3)$, $A_4(3)$, L(3), J(3) and $\Gamma(3)$ for scattering to 3904, 2+ state in ⁴⁰Ca.
 $A_2(4)$, $A_4(4)$, L(4), J(4) and $\Gamma(4)$ for scattering to 4491, 5- state in ⁴⁰Ca.
 $A_2(5)$, $A_4(5)$, L(5), J(5) and $\Gamma(5)$ for scattering to 5613, 4- state in ⁴⁰Ca.
1970Wh06 give graphs for scattering to first three excited states in ⁴⁰Ca for E(p)=5810–6570.
(p,p') and (pol p,p') data are given for inelastic scattering to 3352, 3737, and 3904 states, with E(p)=6010–6550, from 1982Wa12 and 1980Wa11, and to 3737 with E(p)=6000–6500, from 1980Al13.

E(level) [†]	$J\pi^{\S}$	$\Gamma^{\#}$	E(p)(lab) [‡]	Comments
3416 3	1/2+	1.80 keV 18	2390	Γ : other: 1.0 keV 3 (1975Ko13).
3465 4	1/2-	50 keV 20	2440	Γ : from 1972Kl03. Other: 60 keV 6 for E(p)(lab)=2446 keV 5 (1974Wi09), 80 keV 20 for E(p)(lab)=2455 keV 5 (1975Ko13).
3480 5	1/2-	12.0 keV 15	2445	Γ : from 1972Kl03. Other: 60 keV 6 for E(p)(lab)=2446 keV 5 (1974Wi09), 80 keV 20 for E(p)(lab)=2455 keV 5 (1975Ko13).
3732 3	1/2-	12.0 keV 12	2714	Γ : other: 12 keV 2 (1975Ko13).
3774 3	3/2-	0.70 keV 7	2757	$J\pi$: from 1975Ko13, 1974Wi09. Other: 1/2- in 1970Lo18, 1972Kl03. Γ : other: 0.4 keV 1 (1975Ko13).
3787 5	3/2+, 5/2+	0.20 keV 2	2770	Γ : for J=3/2; 0.30 keV 2 for J=5/2 (1974Wi09).
3969 5	1/2+	4 keV	2957	Γ : quoted by 1974Wi09 from a thesis by Brown.
4502 4	3/2+	1.0 keV 2	3503	
4535 4	3/2-	12 keV 3	3537	
4644 4	1/2-	36 keV 10	3649	
4777 4	3/2+	3 keV 1	3785	
4867 4	5/2+	2.0 keV 5	3877	
4947 4	5/2+	1.0 keV 2	3959	
4949 4	5/2-	2.0 keV 4	3961	
5023 4	1/2+	6 keV 2	4037	
5039 4	7/2+, 9/2+	0.4 keV 1	4053	$J\pi$: (9/2+) in 1975Ko13.
5074 4	1/2-	3 keV 1	4089	
5084 4	3/2+	0.7 keV 2	4100	
5143 4	3/2-	3 keV 1	4160	
5356 5	3/2+	3 keV 1	4378	
5374 4	5/2+	7 keV 2	4397	
5396 5	3/2-	4 keV 1	4419	
5419 5	5/2+	18 keV 5	4443	
5490 5	1/2-	12 keV 4	4516	
5493 5	1/2+	1.0 keV 2	4519	
5520 5	5/2-	0.5 keV 2	4547	
5534 5	3/2-	20 keV 5	4561	
5576 5	3/2+, 5/2+	6 keV 2	4604	$J\pi$: (3/2+) in 1975Ko13.
5649 5	5/2-	3 keV 1	4679	
5690 5	1/2-	1.0 keV 3	4721	
5704 5	1/2-	12 keV 4	4735	
5708 5	5/2-	12 keV 4	4739	

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⁴⁰Ca(p,p),(p,p')γ: Res 1980Wa11,1975Ko13,1974Mi16 (continued)

⁴¹Sc Levels (continued)

E(level) [†]	Jπ [§]	Γ [#]	E(p)(lab) [‡]	Comments
5755 5	3/2-	7 keV 3	4788	
5836 5	3/2+, 5/2+	8.7 keV	4871	
5867 4	5/2+	12.3 keV	4902	Jπ: from 1974Tr06. Other: (5/2,7/2)- in 1970Ma16.
5941 5	3/2+		4978	Jπ,E(p)(lab): from 1974Tr06.
5971 5	5/2-, 7/2-	6.6 keV	5009	
5986 5	3/2-	8.7 keV	5024	A ₂ (1)=+0.84 7, A ₄ (1)=-0.10 7, L(1)=1, J(1)=3/2, Γ(1)=0.30 keV (1970Ma16).
6013 5	1/2+	26.7 keV	5052	
6047 5	3/2-	12.1 keV	5087	A ₂ (1)=+0.65 3, A ₄ (1)=-0.06 4, L(1)=1, J(1)=3/2, Γ(1)=0.72 (1970Ma16).
6085 [@] 5			5126 [@]	
6131 5	3/2+, 5/2+	2.9 keV	5173	
6147 5	5/2+	2.9 keV	5189	A ₂ (2)=-0.28 4, A ₄ (2)=0.00 7, L(2)=1, Γ(2)=0.37 (1970Ma16).
6203 5	3/2-	6.5 keV	5247	A ₂ (1)=+0.80 8, A ₄ (1)=-0.11 11, L(1)=1, J(1)=3/2, Γ(1)=0.12 (1970Ma16).
6236 5	5/2-, 7/2-	8.3 keV	5281	
6259 [@] 5			5304 [@]	
6314 [@] 5			5361 [@]	
6326 [@] 5			5373 [@]	
6335 5	1/2+	27.9 keV	5382	L(1)=0, J(1)=1/2 (1970Ma16).
6361 5	5/2+	2.8 keV	5409	A ₂ (1)=-0.06 4, A ₄ (1)=+0.82 4, L(1)=2, J(1)=5/2, Γ(1)=1.7 (1970Ma16).
				A ₂ (3)=+0.10 5, A ₄ (3)=-0.07 7, L(3)=0, J(3)=1/2, Γ(3)=0.86 (1970Ma16).
6399 5	3/2+, 5/2+	8.1 keV	5448	A ₂ (2)=+0.29 4, A ₄ (2)=+0.23 5, L(2)=1, J(2)=3/2, Γ(2)=7.8 (1970Ma16).
6414 5	5/2+	6.0 keV	5463	A ₂ (1)=+0.30 4, A ₄ (1)=+0.65 4, L(1)=2, J(1)=5/2, Γ(1)=0.185 (1970Ma16).
				A ₂ (3)=+0.12 3, A ₄ (1)=+0.02 5, L(3)=0, J(3)=1/2, Γ(3)=0.141 (1970Ma16).
6435 5	5/2-	10.4 keV	5485	A ₂ (2)=-0.27 7, A ₄ (1)=+0.28 7, L(2)=0+2, J(2)=1/2+(5/2), Γ(2)=0.007+0.149 (1970Ma16).
				A ₂ (3)=+0.36 4, A ₄ (3)=+0.05 5, L(3)=1, Γ(3)=0.262 (1970Ma16).
6458 5	(3/2-)	4.9 keV	5508	A ₂ (3)=-0.43 10, A ₄ (3)=-0.02 13, L(3)=(1), Γ(3)=0.048 (1970Ma16).
6469 5	5/2-	12.1 keV	5521	L(1)=3, J(1)=5/2, Γ(1)=0.02 (1974MiYW).
				L(3)=1, Γ(3)=0.1 (1974MiYW).
6476 [@] 5			5527 [@]	
6507 [@] 5			5558 [@]	
6513 5	5/2+	18.8 keV	5565	A ₂ (1)=+0.70 6, A ₄ (1)=+0.75 7, L(1)=2, J(1)=5/2, Γ(1)=0.206 (1970Ma16).
				A ₂ (3)=+0.08 5, A ₄ (3)=+0.11 6, L(3)=0, J(3)=1/2, Γ(3)=0.308 (1970Ma16).
6522 [@] 5			5574 [@]	
6533 5	5/2+	1.3 keV	5585	A ₂ (2)=+0.03 4, A ₄ (3)=-0.05 6, L(2)=1, J(2)=1/2, Γ(2)=1.27 (1970Ma16). Other: Γ(2)=0.1 (1974MiYW).
6572 5	5/2-	4.5 keV	5625	A ₂ (3)=-0.63 6, A ₄ (3)=+0.10 8, L(3)=1, Γ(3)=0.143 (1970Ma16).
6585 5	1/2-	4.5 keV	5638	E(p): average from 1970Ma16 and 1974MiYW.
				Angular distribution asymmetric, A ₁ =0.85 7, implying interference of resonances having the same spin (1/2) and opposite parity (1970Ma16).
6589 5	1/2+		5642	L(1)=1, J(1)=1/2, Γ(1)=22 (1974MiYW).
				E(p): average from 1970Ma16 and 1974MiYW.
				Angular distribution asymmetric, A ₁ =0.90 9, implying interference of resonances having the same spin (1/2) and opposite parity (1970Ma16).
6610 5	1/2+	9.5 keV	5664	L(1)=0, J(1)=1/2, Γ(1)=22 (1974MiYW).
				A ₂ (1)=+0.27 10, A ₄ (1)=+0.00 10, L(1)=0, J(1)=1/2 (1970Ma16).
				Angular distribution asymmetric, A ₁ =0.90 7, implying interference of resonances having the same spin (1/2) and opposite parity (1970Ma16).
6622 5	5/2+	3.2 keV	5676	A ₂ (1)=+0.17 8, A ₄ (1)=+0.74 12, L(1)=2, J(1)=5/2 (1970Ma16).
				A ₂ (3)=+0.06 5, A ₄ (3)=-0.05 7, L(3)=0, J(3)=1/2, Γ(3)=0.193 (1970Ma16).

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⁴⁰Ca(p,p),(p,p')γ: Res 1980Wa11,1975Ko13,1974Mi16 (continued)

⁴¹Sc Levels (continued)

E(level) [†]	Jπ [§]	Γ [#]	E(p)(lab) [‡]	Comments
6643@ 5			5698@	
6651 5	9/2+	4.0 keV	5706	A ₂ (2)=+0.55 4, A ₄ (2)=-0.15 6 (1970Ma16), L(2)=1, Γ(2)=0.03 (1974MiYW). Other: J(2)=1/2, Γ(2)=3.57 (1970Ma16). L(3)=0, J(3)=1/2, Γ(3)=0.09 (1970Ma16). L(4)=1, Γ(4)=0.48 (1970Ma16).
6691 5	3/2-	3.2 keV	5747	A ₂ (1)=+0.38 23, A ₄ (1)=-0.06 32, L(1)=1, J(1)=3/2, Γ(1)=0.42 (1970Ma16). A ₂ (3)=+0.01 5, A ₄ (3)=-0.10 6, L(3)=1, J(3)=(1/2), Γ(3)=2.6 (1970Ma16).
6700 5	5/2+	6.2 keV	5756	A ₂ (1)=+1.41 5, A ₄ (1)=+0.92 5, L(1)=2, J(1)=5/2, Γ(1)=1.57 (1970Ma16). A ₂ (2)=+0.04 5, A ₄ (2)=+0.07 8, L(2)=1, J(2)=1/2, Γ(2)=1.23 (1970Ma16). A ₂ (3)=+0.00 4, A ₄ (3)=+0.02 6, L(3)=0, J(3)=1/2, Γ(3)=2.76 (1970Ma16).
6730@ 5			5787@	Jπ: other: 5/2(-) (1974MiYW), with L(1)=(3), L(2)=(0), L(3)=(1). Inelastic branch to 3904 (1970Ma16).
6741 5	5/2+	7.2 keV	5798	Jπ: from 1970Ma16. Other: (1/2+) in 1974MiYW. A ₂ (2)=+0.03 3, A ₄ (2)=+0.05 4, L(2)=1, J(2)=1/2, Γ(2)=0.243 (1970Ma16). A ₂ (3)=-0.17 4, A ₄ (3)=+0.05 6, L(3)=0, Γ(3)=0.121 (1970Ma16). Inelastic branches to 3737 and 3904 (1970Ma16).
6752@ 5			5810@	L(1)=1, J(1)=3/2, (1974MiYW).
6772 5	(3/2-)		5830	A ₂ (1)=+0.86 6, A ₄ (1)=-0.22 7 (1970Ma16).
6783 5	5/2-	10.4 keV	5841	A ₂ (3)=-0.87 4, A ₄ (3)=+0.12 6, L(3)=1, Γ(3)=0.240 (1970Ma16). Jπ: other: 5/2-, 7/2-, with no inelastic cross section.
6824 5	5/2+	4.1 keV	5883	A ₂ (1)=+1.07 6, A ₄ (1)=+0.76 9, L(1)=2, J(1)=5/2, Γ(1)=0.030 (1970Ma16). A ₂ (2)=-0.10 5, A ₄ (2)=-0.05 7, L(2)=1, Γ(2)=0.078 (1970Ma16). A ₂ (3)=+0.07 5, A ₄ (3)=-0.02 7, L(3)=0, J(3)=1/2, Γ(3)=0.077 (1970Ma16).
6841 5	5/2-	6.3 keV	5901	A ₂ (2)=-0.13 6, A ₄ (2)=0.00 8, L(2)=0, J(2)=1/2, Γ(2)=1.36 (1970Ma16). A ₂ (3)=+0.17 5, A ₄ (3)=+0.07 7, L(3)=1, Γ(3)=4.25 (1970Ma16). Other: Γ(2)=0.2, Γ(3)=1.5 (1974MiYW).
6857 5	3/2-	9.6 keV	5917	A ₂ (3)=-0.51 1, A ₄ (3)=+0.15 3, L(3)=1, J(3)=3/2, Γ(3)=0.55 (1970Ma16).
6872 5	(1/2, 3/2)-		5933	L(1)=4, Γ(1)=(0.02) (1974MiYW).
6880 5	9/2+	1.3 keV	5941	L(2)=1, Γ(2)=(0.14) (1974MiYW). L(3)=2, Γ(3)=(0.26) (1974MiYW). L(4)=1, Γ(4)=(0.012) (1974MiYW). Other: A ₂ (2)=0.10 2, A ₄ (2)=0.05 5 and A ₂ (3)=+0.95 1, A ₄ (3)=+0.48 2, L(3)=2, J(3)=5/2, Γ(3)=0.79, Γ(4)=0.046 (1970Ma16).
6895 5	(9/2+)	3.4 keV	5956	L(4)=(1), Γ(4)=0.008 (1974Mi16,1974MiYW).
6908 5	5/2-	6.9 keV	5970	
6923 5	(5/2)-	4.5 keV	5985	E(p)(lab): doublet (1970Wh06). A ₂ (2)=-0.08 6, A ₄ (2)=+0.05 9, L(2)=(0), J(2)=(1/2), Γ(2)=0.072 (1970Ma16). Other: Γ(2)=0.25 (1974MiYW). A ₂ (3)=0.57 6, A ₄ (3)=+0.12 9 (1970Ma16), L(3)=1, Γ(3)=0.4 (1974Mi16,1974MiYW). Other: Γ(3)=0.203 (1970Ma16).
6947 5		1.3 keV	6010	A ₂ (2)=-0.11 4, A ₄ (2)=+0.21 6, L(2)=(1), Γ(2)=1.28 (1970Ma16).
6970 4	5/2+	6.9 keV	6033	Jπ: from 1970Ma16,1980Al13. Other: 1/2+ in 1980Wa11. Γ: Other: 20 keV (1980Wa11). A ₂ =0.541 28, δ=+0.095 18 (1980Al13). A ₂ (2)=+0.04 1, A ₄ (2)=-0.02 2, L(2)=1, J(2)=1/2, Γ(2)=0.88 (1970Ma16).
6996 5	9/2+	1.3 keV	6060	A ₂ (2)=+0.62 4, A ₄ (2)=-0.06 2, L(2)=1, J(2)=3/2, Γ(2)=0.88 (1970Ma16). A ₂ (3)=+0.49 9, A ₄ (3)=+0.23 11, L(3)=2, J(3)=5/2, Γ(3)=0.427 (1970Ma16).
7004 5	(9/2+)	<1.0 keV	6068	L(4)=1, Γ(4)=(0.05) (1974MiYW).

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$^{40}\text{Ca}(\text{p},\text{p}),(\text{p},\text{p}')\gamma$: Res 1980Wa11,1975Ko13,1974Mi16 (continued)

 ^{41}Sc Levels (continued)

E(level) [†]	J π [§]	Γ [#]	E(p)(lab) [‡]	Comments
7022@ 5			6086@	
7033 4	5/2+	3.2 keV	6098	A ₂ (2)=-0.19 3, A ₄ (2)=+0.06 5, L(2)=1, Γ (2)=2.9 (1970Ma16). Other: Γ (2)=0.5 (1974MiYW).
7069 5	5/2-	9.3 keV	6135	L(3)=(0), Γ (3)=(0.1) (1974MiYW).
7078@ 5			6144@	A ₂ (3)=-0.97 2, A ₄ (3)=+0.09 4, L(3)=1, Γ (3)=2.8 (1970Ma16).
7107 5	5/2+	19.8 keV	6174	A ₂ (2)=-0.27 1, A ₄ (2)=+0.02 2, L(2)=1, Γ (2)=14.3 (1970Ma16). Other: L(2)=1, Γ (2)=7.6 (1974MiYW).
7113 5	(3/2, 5/2)-	14.0 keV	6180	L(3)=0, Γ (3)=0.7 (1974MiYW).
7123 4		7.7 keV	6190	J π : A ₂ =0.450 17, δ =-0.002 16 (1980Al13).
7142 5	5/2+	12.0 keV	6209	L(3)=1 (1970Ma16).
				Doublet J=1/2- and J=3/2+ (1970Ma16).
				L(1)=2, Γ (1)=0.05 (1974MiYW).
				A ₂ (2)=-0.65 1, A ₄ (2)=+0.11 2, L(2)=1, J(2)=3/2, Γ (2)=9.0 (1970Ma16).
				A ₂ (3)=-0.05 4, A ₄ (3)=-0.12 6, L(3)=0, J(3)=1/2, Γ (3)=1.9 (1970Ma16).
				J π : A ₂ =0.109 82, A ₄ =-0.141 56, A ₆ =-0.243 28, δ =-0.289 51 (1980Al13).
7177 5	1/2-, 3/2+, 7/2-		6245	
7201 5	5/2+	40 keV	6270	L(2)=1, Γ (2)=13 (1974MiYW).
7206			6275	J π : A ₂ =0.198 42, A ₄ =-0.061 25, δ =-0.150 24 (1980Al13).
7245 5	5/2-	12 keV	6315	Inelastic branches to 3352 and 3904 (1974MiYW).
7264			6335	J π : from 1980Wa11. Other: (3/2-) in 1974MiYW.
7279 5	5/2+	9 keV	6350	Γ (3)=(9) (1974MiYW).
7297 5	(7/2+)		6368	Inelastic branch to 3352 (1974MiYW).
7313			6385	L(2)=1, Γ (2)=6 (1974MiYW).
7333 5	5/2+	23 keV	6405	J π : A ₂ =0.449 25, δ =+0.085 19 (1980Al13).
7338 5	5/2-		6410	J π : from 1974MiYW. Other: 1/2-, 3/2+ in 1980Wa11.
7347 5	(5/2+)	10 keV	6420	L(4)=(1), Γ (4)=(0.03) (1974MiYW).
7352 5	(9/2+)	8 keV	6425	Inelastic branches to 3352 and 3904 (1974MiYW).
7382			6455	J π : from 1980Wa11. Other: 5/2, 7/2- in 1974Mi16.
7396 5	(9/2+)		6470	Inelastic branch to 3352 (1974MiYW).
7406 5	(5/2)		6480	Inelastic branch to 3352 (1974MiYW).
7421			6495	Inelastic branch to 3904 (1974MiYW).
7469 5	(3/2+)		6545	L(2)=1, Γ (2)=(0.7) (1974MiYW).
7474 5		44 keV	6550	L(3)=(0), Γ (3)=(1.1) (1974MiYW).
7489 5	(7/2-, 9/2+)		6565	
7494			6570	Inelastic branch to 4491 (1974MiYW).
7523 5	(7/2+)		6600	Inelastic branches to 3337 and 3904 (1974MiYW).
7538 5	3/2(+)	8 keV	6615	Γ (1)=0.4 (1974MiYW).
7557 5	3/2-	12 keV	6635	Γ (3)=0.7 (1974MiYW).
7572 5	3/2+	10 keV	6650	L(3)=1, Γ (3)=0.8 (1974MiYW).
7606 5	(5/2-)		6685	Γ (4)=(0.01) (1974MiYW).
7640 5	(9/2+)	30 keV	6720	Γ (1)=0.4 (1974MiYW).
7650 5	(5/2+)		6730	L(3)=0, Γ (3)=0.6 (1974MiYW).
7660 5	1/2-	30 keV	6740	Γ (1)=(0.4) (1974MiYW).
7718 5	3/2-	20 keV	6800	L(3)=(1), Γ (3)=(2) (1974MiYW).
7742 5	(3/2+)		6825	Inelastic branch to 4491 (1974MiYW).
7777 5	7/2-	35 keV	6860	L(2)=(1), Γ (2)=(1.4) (1974MiYW).
7815 5	(1/2)		6900	L(1)=1, Γ (1)=15 (1974MiYW).
				L(3)=1, Γ (3)=9 (1974MiYW).
				L(3)=1, Γ (3)=4 (1974MiYW).
				Inelastic branch to 3352 (1974MiYW).
				L(2)=(0), Γ (2)=2 (1974MiYW).
				L(3)=1, Γ (3)=30 (1974MiYW).
				Inelastic branch to 3352 (1974MiYW).

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⁴⁰Ca(p,p),(p,p')γ: Res 1980Wa11,1975Ko13,1974Mi16 (continued)

⁴¹Sc Levels (continued)

E(level) [†]	Jπ [§]	Γ [#]	E(p)(lab) [‡]	Comments
7830 5	5/2-	33 keV	6915	Γ(2)=3 (1974MiYW). Γ(3)=4 (1974MiYW).
7855 5	(9/2+)	27 keV	6940	L(4)=1 (1974MiYW).
7874 5	(1/2-)	20 keV	6960	L(2)=(3), Γ(2)=(2.5) (1974MiYW). L(3)=(1), Γ(3)=(4.5) (1974MiYW). Also a branch to 3352 (1974MiYW).
7894 5			6980	Inelastic branches to 3737 and 4491 (1974MiYW).
7903 5	(1/2)		6990	Inelastic branches to 3352, 3737 and 3904 (1974MiYW).
7938 5			7025	Inelastic branch to 4491 (1974MiYW).
7947 5			7035	Inelastic branch to 3737 (1974MiYW).
7962 5			7050	Inelastic branch to 3352 (1974MiYW).
7981 5			7070	Inelastic branch to 4491 (1974MiYW).
8006 5	(3/2-)	25 keV	7095	Γ(3)=(15) (1974MiYW).
8089 5	(3/2-)	50 keV	7180	Γ(1)=(10) (1974MiYW). L(3)=1, Γ(3)=(24) (1974MiYW).
8147 5	(5/2+)	75 keV	7240	L(2)=(1), Γ(2)=(22) (1974MiYW).
8450 10	(9/2+)		7550	L(5)=(1), Γ(5)=(0.05) (1973Ta26).
8645 10	(9/2+)		7750	L(5)=(1), Γ(5)=(0.12) (1973Ta26).
8879 10	9/2+	8 keV	7990	L(5)=1, Γ(5)=0.32 (1973Ta26).
9128 10	9/2+	18 keV	8245	L(5)=1, Γ(5)=0.50 (1973Ta26).
9269 10	9/2+	10 keV	8390	L(5)=1, Γ(5)=0.78 (1973Ta26).
9415 10	9/2+	11 keV	8540	L(5)=1, Γ(5)=0.85 (1973Ta26).
9513 10	9/2+	15 keV	8640	L(5)=1, Γ(5)=0.50 (1973Ta26).
9659 10	9/2+	16 keV	8790	L(5)=1, Γ(5)=0.42 (1973Ta26).
9698 10	9/2+	12 keV	8830	L(5)=1, Γ(5)=0.40 (1973Ta26).
9815 10	9/2+	13 keV	8950	L(5)=1, Γ(5)=0.33 (1973Ta26).

[†] Excitation energies are deduced (evaluators) from S(p)(⁴¹Sc)+E(p)(c.m.), where S(p)=1085.00 8 (2012Wa38).

[‡] E(p)(lab) is the weighted average from 1975Ko13, 1974Wi09, 1974Ve11, 1972Kl03 for E=3400-5800; from 1970Ma16 for E=5800-6900; from 1974Mi16 and 1973Ta26 for E=6900-8800; from 1980Wa11, 1974Mi16, 1970Ma16, 1973Ta26 for E=8800-9900, with exceptions noted.

[§] From 1975Ko13, 1974Wi09, 1974Ve11, 1970Lo18 for E=3400-5800; from 1973Tr06, 1970Ma16 for E=5800-6900; from 1974Mi16 for E=5450-7300; from 1973Ta26 for E=7300-9900.

[#] Γ are from 1974Wi09 for E=3400-3800; from 1975Ko13 for E=3800-5800; from 1970Ma16 for E=5800-7250; from 1974Mi16 for E=7250-8150; from 1973Ta26 for E=8150-9900, with exceptions noted.

[@] A proton branch was observed, but too weak for measurement of parameters.

γ(⁴¹Sc)

⁴⁰Ca(d,n) 1969Ge05,1975Vi05

1969Ge05: E(d)=5.0, 6.0, 6.5 MeV. Measured σ(θ) using time-of-flight system with NE213 liquid scintillator and neutron pol(θ) using neutron polarimeter; DWBA analysis.

1975Vi05, 1976Vi06: E(d)=10.5-11 MeV. Measured probability of proton decay (to ⁴⁰Ca) from the residual ⁴¹Sc proton-unbound states. Measured neutron-proton(θ) using NE213 liquid scintillator for neutrons and four surface barrier detectors for protons; DWBA analysis.

Others:

1973DoZG: Measured neutron polarization.

1972Ta07 (also 1971TaZN): E(d)=3.8 MeV. Measured σ(θ), pol(θ) for neutrons for ground state.

1970GrZY: E(d)=3-6 MeV. Measured σ(θ).

1968Le05: E(d)=5.0, 6.0, and 6.5 MeV. Measured σ(θ) for ground state.

1963Kn04: E(d)=7.7 MeV. Four levels reported using time-of-flight for neutrons.

1959Pl53: E(d)=4.15 MeV. Measured σ(θ) for first four states.

⁴¹Sc Levels

E(level) [†]	Jπ [§]	Γ _p (keV) [#]	L [‡]	S [†]	Comments
0.0			3	0.83	S: From 1968Le05.
1718 7			1	0.67	

Continued on next page (footnotes at end of table)

⁴⁰Ca(d,n) 1969Ge05,1975Vi05 (continued)

⁴¹Sc Levels (continued)

E(level) [†]	Jπ [‡]	Γ _p (keV) [#]	L [‡]	S [†]	Comments
2096 7			2		L: other: L=1 in 1959Pl53.
2415 8			1	0.05	
2593 9					
2719 8			0		
3463 9	1/2-	73 keV 10	1		E(level): other: 3470 20 (1975Vi05). L: from 1975Vi05. Other: (0,1) in 1969Ge05.
3721 10					
3776 10					
4950 [#] 20	5/2-	1.7 keV 4			
5040 [#] 20	9/2+	0.40 keV 7			
5700 [#] 20	5/2-	14 keV 3			
5860 [#] 20	5/2-	8.8 keV 17			
5970 [#] 20	(5/2-, 7/2)-	2.6 keV 5			Γ _p (keV): for J=5/2.
6460 [#] 20	5/2-	18 keV 3			

[†] From 1969Ge05, except where noted.

[‡] From DWBA analysis of σ(θ) (1969Ge05).

[§] From neutron-proton angular distribution measurements (1975Vi05).

[#] From 1975Vi05.

⁴⁰Ca(³He,d),(pol ³He,d) 1970Yo02

1970Yo02: (³He,d) with E(³He)=40 MeV. Measured σ(θ) for θ=10° to 50° using ΔE-E semiconductor telescope (FWHM=60 keV); DWBA analysis.

1980Lu03: (pol ³He,d) with E(pol ³He)=33.3 MeV. Measured σ(θ), Ay(θ) for g.s.

1991Gu02: (³He,d) with E(³He)=240 MeV. Measured σ(θ) for θ=0° to 10° using four solid state telescopes (FWHM=200 keV); DWBA analysis.

Others:

1976Fr22 (also analysis by 1977Fr02): (³He,d) with E(³He)=9.0, 9.85, and 10.7 MeV. Measured σ(θ) for ground state.

1965Bo15: (³He,d) with E(³He)=18.05 MeV. Measured σ(θ) for 8 levels in ⁴¹Sc. L values for first 4 levels consistent with subsequent measurements.

1960We04: (³He,d) with E(³He)=24 MeV. Measured σ(θ) for ground state and levels at 1690, 3350, 5100 and 6010 keV.

⁴¹Sc Levels

E(level) [†]	Jπ	L [†]	S ^{†‡}	Comments
0.0	7/2-	3	1.12	Jπ,L: from (pol ³ He,d) (1980Lu03). S: others: 0.96 (1991Gu02), 0.6 (1980Lu03).
1718 20		1	0.85	configuration=2p3/2 (1991Gu02). S: other: 0.86 (1991Gu02).
2100 20		2	0.067	
2419 20		1	0.091	
2686 20				
2892 20		4	0.013	
2955 20				
3192 20		3	0.034	
3471 20		1	0.75	configuration=2p1/2 (1991Gu02). S: other: 0.75 (1991Gu02).
3744 20		1	0.08	S: expected contributions from the 3769-keV (L=1) and 3779-keV (L=2) levels have been taken account in the determination of S.
4030 20	(3,4)			S: (0.0016-0.0070) for L=3 and (0.0025-0.0060) for L=4.
4519 20	4		0.015	
4812 20	(3,4)			S: (0.0049-0.015) for L=3 and (0.00035-0.0010) for L=4.
5037 20	4		0.18	S: other: 0.12 (1991Gu02). E(level): complex peak in 1991Gu02. configuration=1g9/2 (1991Gu02).
5413 20		2	0.031	E(level): may contain contribution from six known levels near this energy. Primary contributions are expected to be from the 5416-keV (L=2) and 5371-keV (L=2) levels.
5542 20				

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(^3\text{He},\text{d}),(\text{pol } ^3\text{He},\text{d})$ 1970Yo02 (continued) ^{41}Sc Levels (continued)

E(level) [†]	L [‡]	S ^{‡‡}	Comments
5709 20	3	0.15	S: other: 0.31 (1991Gu02). configuration=1f5/2 (1991Gu02).
5862 20	3	0.060	configuration=1f5/2 (1991Gu02).
6470 20	(3)	(0.09)	E(level): likely doublet composed of the 6434-keV (L=3) and 6468-keV (L=3) levels.
6902 40			
7400 §			
7814 40			
8119 40			
8594 40			configuration=1g9/2 (1991Gu02) for slice of excitation energy centered at 8640-keV with width of 480 keV.
9600 §			configuration=1g9/2 (1991Gu02) for slice of excitation energy centered at 9600-keV with width of 520 keV.
10500 §			E(level): unresolved multiplet.

[†] From 1970Yo02, except where noted.[‡] $d\sigma/d\Omega_{\text{exp}} = NC^2S(d\sigma/d\Omega)_{\text{DWBA}}$ with $C^2=1$ for the ($^3\text{He},\text{d}$) reaction on T=0 target and N=4.42.

§ From 1991Gu02.

 $^{40}\text{Ca}(\alpha,\text{t})$ 1970Yo011970Yo01: E(α)=40 MeV. Measured $\sigma(\theta)$ using ΔE -E surface barrier semi-conductor detector telescope (FWHM=60–80 keV); DWBA analysis.1982FoZU: E(α)=28 MeV. Measured $\sigma(\theta)$; CCBA analysis.

Others:

1969Ga11: E(α)=56 MeV. Measured $\sigma(\theta)$ for g.s.1972Ha08 (also 1971Ha49): E(α)=104 MeV. Measured $\sigma(\theta)$ for g.s. ^{41}Sc Levels

E(level) [†]	L [‡]	(2J+1)S [#]	E(level) [†]	E(level) [†]
0.0	3	8.88	3356 20	4038 §
1717 20	1	3.66	3703 §	4502 30
2077 20	2		3788 §	5025 20
2400 20			3823 §	5568 30
2895 20	(3,4)	0.47, 0.13	3905 20	
3174 20			4005 20	

[†] From 1970Yo01, except where noted.[‡] From DWBA analysis (1970Yo01).

§ From 1982FoZU.

[#] From $(d\sigma/d\Omega)_{\text{exp}} = NS(2J+1)(d\sigma/d\Omega)_{\text{DWBA}}$ with N=1.8. **$^{40}\text{Ca}(^7\text{Li},^6\text{He})$ 1986Sa19,2000Yo09**1986Sa19: E(^7Li)=34 MeV. Measured $\sigma(\theta)$ using cooled array of three ΔE -E silicon surface barrier detector telescopes; DWBA analysis.2000Yo09: E(^7Li)=50 MeV/nucleon. Measured ^6He at 0° in the focal plane of the A1200 spectrometer. Focal plane detectors consisted of two position sensitive silicon detectors followed by a plastic scintillator. An array of eight silicon detectors was used to detect charged particles in coincidence with the ^6He . ^{41}Sc Levels

E(level) [†]	J π [‡]	L [†]	C ² S [†]	Comments
0.0	7/2-	3	0.75	
1718 20	3/2-	1	0.55	

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(^7\text{Li}, ^6\text{He})$ 1986Sa19,2000Yo09 (continued) ^{41}Sc Levels (continued)

<u>E(level)[†]</u>	<u>$J\pi^{\ddagger}$</u>	<u>$L^{\dagger}$</u>	<u>$C^2S^{\dagger}$</u>	<u>Comments</u>
5040				E(level): from 2000Yo09. configuration= $1g_{9/2}$ (2000Yo09).
[†] From 1986Sa19, except where noted.				
[‡] From the Adopted Levels.				

 $^{40}\text{Ca}(^{12}\text{C}, ^{11}\text{B})$ 1972Sc21E(^{12}C)=114 MeV. Measured $\sigma(\theta)$ using a telescope of solid state detectors. ^{41}Sc Levels

<u>E(level)</u>	<u>Comments</u>
0.0	$d\sigma/d\Omega=1$ mb/sr at forward angles.

 $^{40}\text{Ca}(^{13}\text{C}, ^{12}\text{B})$ 1990Br25E(^{13}C)=650 MeV. Measured $\sigma(\theta)$ using magnetic spectrograph with two drift chambers and parallel plate counter at the focal plane (FWHM=250 keV); DWBA analysis. ^{41}Sc Levels

<u>E(level)</u>	<u>$J\pi^{\ddagger}$</u>	<u>$d\sigma/d\Omega$ (mb/sr)[†]</u>	<u>Comments</u>
0.0	$7/2-$	35.6	
1700	$3/2-$		
2890	$7/2+$	3.8	
3150	$(5/2-)$		
5040	$9/2+$	13.0	
7200		6.0	
8650		4.7	
9900		1.6	
11100		20.5	E(level): group of states or broad structure.
[†] Measured at $1^\circ(\text{c.m.})$.			
[‡] From the Adopted levels.			

 $^{40}\text{Ca}(^{16}\text{O}, ^{15}\text{N})$ 1972Mo14,1973Ko011972Mo14,1973Ko01: E(^{16}O)=42.0, 48.0, and 56.0 MeV. Measured $\sigma(\theta)$ using four $\Delta E-E$ counter telescopes (FWHM=250 keV); DWBA analysis.
Others: 1973Be12, 1973Ch10. ^{41}Sc Levels

<u>E(level)</u>	<u>$J\pi$</u>	<u>$L^{\dagger}$</u>
0.0	$7/2-$	4
[†] From DWBA analysis of $\sigma(\theta)$ (1973Ko01).		

 $^{40}\text{Ca}(^{28}\text{Si}, ^{27}\text{Al})$ **1986Vi02**

E(^{28}Si)=225 MeV. Measured $\sigma(\theta)$ using the Argonne split-pole magnetic spectrograph with a position sensitive ionization chamber located at the focal plane (FWHM=400 keV); DWBA analysis.

 ^{41}Sc Levels

 E(level)

0 . 0

Adopted Levels, Gammas

$Q(\beta^-) = -15890$ SY; $S(n) = 14920$ 160; $S(p) = 2463$ 28; $Q(\alpha) = -4978$ 28 2012Wa38.
 $\Delta(Q(\beta^-)) = 300$ (syst, 2012Wa38).
 $Q(\epsilon p) = 11860$ 28 (syst, 2012Wa38).

^{41}Ti Levels

Cross Reference (XREF) Flags

A ^{42}Cr ϵp Decay: 13.3 ms

E(level)	J π	XREF	T $_{1/2}$	Comments
0.0	3/2+	A	81.9 ms 5	$\% \epsilon + \% \beta^+ = 100$; $\% \epsilon p = 100$. $\% \epsilon p$: from 1974Se11. $J\pi$: $\log ft = 4.8$ to 1/2+ and 5.0 to 5/2+ in ^{41}Ti ϵ decay. $T_{1/2}$: Weighted average of 82.6 ms 5 (2007Do17), 81.3 ms 20 (1998Bh12), 82 ms 3 (1998Li46), 80.1 ms 9 (1997Tr11), 81 ms 4 (1996Fa09), 80 ms 2 (1974Se11). Others: 88 ms 1 (1966Po12), 90.5 ms 20 (1964Re08).
1623.0 11		A		

$\gamma(^{41}\text{Ti})$

E(level)	E γ
1623.0	1623.0 † 11

† Placement of transition in the level scheme is uncertain.

^{42}Cr ϵp Decay: 13.3 ms 2007Do17

Parent ^{42}Cr : $E=0$; $J\pi=0+$; $T_{1/2}=13.3$ ms 10; $Q(g.s.)=14650$ syst; $\% \epsilon p$ decay=94.4 50.
 $^{42}\text{Cr}-T_{1/2}$: From the average in two experiments of the decay time distribution in 2007Do17. Previous result from the same group: 13.4 ms +36-24 (2001Gi01).
 $^{42}\text{Cr}-Q(\epsilon p)$: 14650 400 (syst, 2012Wa38).
 $^{42}\text{Cr}-\% \epsilon p$ decay: $\%$ From 2007Do17. ϵp is expected to be 100 since ^{42}V is particle unbound.
 2007Do17: ^{42}Cr isotope produced by fragmentation at SISSE/LISE3 facility in GANIL. Fragment identification by energy loss, residual energy and time-of-flight measurements using two micro-channel plate (MCP) detectors and Si detectors. Double-sided silicon-strip detectors (DSSSD) and a thick Si(Li) detector were used to detect implanted events, charged particles and β particles. The γ rays were detected by four Ge detectors. Coincidences measured between charged particles and γ rays. $T_{1/2}$ measured by time correlation of implantation events due to ^{42}Cr and subsequent emission of protons and γ rays. Total proton branching ratio obtained from time spectrum of events with energy >900 keV in the charged-particle spectrum. Possible small contributions from delayed- α and delayed-2p decays are ignored. This decay was studied in two experiments by 2007Do17.
 2001Gi01: ^{42}Cr isotope produced by fragmentation at SISSE/LISE3 facility in GANIL. Fragment identification by energy loss, residual energy and time-of-flight measurements using Si and Ge detectors.

^{41}Ti Levels

E(level)	J $\pi^{\dagger}$	T $_{1/2}^{\dagger}$	Comments
0.0	3/2+	81.9 ms 5	$T_{1/2}$: 82.6 ms 5 from decay time spectrum in 2007Do17.
1623.0 11			

† From Adopted Levels.

Delayed protons

E(p) ‡	I(p) $^{\dagger \S}$	Comments
1537# 35	9 7	

Continued on next page (footnotes at end of table)

^{42}Cr ϵp Decay: 13.3 ms 2007Do17 (continued)

Delayed protons (continued)

$E(\text{p})^{\ddagger}$	$I(\text{p})^{\dagger\S}$	Comments
1965 17	18 6	E(p): 2007Do17 cannot definitively attribute proton group (1968 keV 19) to ϵp or a 2p decay of ^{42}Cr . However, in 2001Gi01, a peak at 1.905 MeV 20 was considered to be from ϵp decay of ^{42}Cr since its half life of 13.4 ms +36-24 contradicted the calculated partial half life (10^{-12}s) of an expected 2 proton decay.
2550# 30	9 7	
3806# 20	6 4	

† Absolute intensity per 100 decays.

‡ The proton energies are in the center-of-mass system. Evaluators have quoted the average values of 2007Do17 and 2001Gi01 as shown in Table 10 of 2007Do17.

§ Average values of intensities in 2001Gi01 and 2007Do17 as shown in Table 10 of 2007Do17.

Not seen in 2007Do17 due to limited statistics.

 $\gamma(^{41}\text{Ti})$

E_{γ}	E(level)	Comments
1623.0 ‡ 11	1623.0	E_{γ} : The evaluators consider this transition uncertain due to the very low count rate as seen in Fig.20 of 2007Do17. However authors have reported $I_{\gamma}=35$ 19 in Table 10. No proton coincidence was observed with this γ due to limited statistics (2007Do17).

‡ Placement of transition in the level scheme is uncertain.

Decay Scheme

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