

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja, E. A. Mccutchan		NDS 133, 1 (2016)	30-Sep-2015

$Q(\beta^-)=2492.0$ 3; $S(n)=6098.9$ 3; $S(p)=12800$ 30; $Q(\alpha)=-8596.0$ 4 [2012Wa38](#)

 ^{41}Ar Levels

$^{40}\text{Ar}+n$ resonance work ([1991Wi02](#)) is not included in Adopted Levels, 206 resonances below $E(n)=1520$ keV (6110-7580 excitation energy in ^{41}Ar) were reported with energies, J^π 's and $g\Gamma_n$ values. See $^{40}\text{Ar}(n,n)$: resonances dataset for details.

Cross Reference (XREF) Flags

A	^{41}Cl β^- decay (38.4 s)	E	$^{40}\text{Ar}(^{13}\text{C}, ^{12}\text{C})$
B	$^{40}\text{Ar}(n,\gamma), (\text{pol } n,\gamma)$ $E=\text{thermal}$	F	$^{40}\text{Ar}(n,\gamma)$ $E=\text{res}$
C	$^{40}\text{Ar}(d,p), (\text{pol } d,p), ^2\text{H}(^{40}\text{Ar}, p)$	G	$^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$
D	$^{40}\text{Ar}(d,p\gamma), ^2\text{H}(^{40}\text{Ar}, p\gamma)$		

E(level)@	J^π ‡	$T_{1/2}$ †	XREF	Comments
0	$7/2^-$	109.61 min 4	ABCDEFGG	$\% \beta^- = 100$ $\mu = -1.309$ 8 (2008BI01) $Q = -0.042$ 4 (2008BI01) $T_{1/2}$: 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 (1946BI28), 110 min 1 (1936Sn01). Others: 109.31 min (2014Bh09), 103.5 min 24 (1969Bo11), 111 min 1 (1956Sc91), 107 min 3 (1950Br29). μ, Q : From collinear fast beam laser spectroscopy-accelerated beam. See compilation in 2014StZZ and recommended Q in 2013StZZ . J^π : L(pol d,p)=3 and γ from $(9/2^-)$. J^π : L(pol d,p)=3 and γ from $1/2^-$. $T_{1/2}$: From advanced time delayed $\beta\gamma\gamma(t)$ method in ^{41}Cl β^- decay (2007Wh01). Others: 410 ps 30 (1966Fo12), >3.5 ps (1977Sc11).
167.11 9	$5/2^-$	315 ps 15	ABCDEFGG	$T_{1/2}$: From advanced time delayed $\beta\gamma\gamma(t)$ method in ^{41}Cl β^- decay (2007Wh01). Others: 340 ps 20 (1966Fo12), >2.8 ps (1977Sc11).
515.77 15	$3/2^-$ #	0.26 ns 8	ABCD FG	$T_{1/2}$: From advanced time delayed $\beta\gamma\gamma(t)$ method in ^{41}Cl β^- decay (2007Wh01). Others: 340 ps 20 (1966Fo12), >2.8 ps (1977Sc11).
1033.94 16	$3/2^+$	5 ps +28-3	ABCD FG	$T_{1/2}$: from 4.5 ps +277-26 from $\tau=6.5+400-37$ (1978Ra13). Other: >2.8 ps (1977Sc11). J^π : L(pol d,p)=2.
1353.71 11	$3/2^-$ #	0.40 ps 6	ABCDEFGG	$T_{1/2}$: From weighted average of 0.44 ps 6 from $\tau=0.64$ ps +9-8 (1977Sc11) and 0.32 ps 8 from $\tau=0.46$ ps 12 (1978Ra13). Other: <100 ps (1966Fo12).
1504.8 6	$(9/2^-)$		G	J^π : Agrees with shell model calculations in $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$.
1629.7 3	$(11/2^-)$		G	J^π : Agrees with shell model calculations in $^{208}\text{Pb}(^{40}\text{Ar}, X\gamma)$ (2011Sz02).
1636 2	$(3/2^-)$		C	$E(\text{level}), J^\pi$: 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	$1/2^+$	≤ 46 ps	A CD G	$T_{1/2}$: From advanced time delayed $\beta\gamma\gamma(t)$ method in ^{41}Cl β^- decay (2007Wh01).
1988 3			C	
2321 10			C	
2397.9 4	$1/2^-$ #	0.12 ps 3	BCD G	$T_{1/2}$: From $\tau=0.17$ ps 5 (1978Ra13).
2568 1			C	
2701 3	$1/2^-, 3/2^-$		C	$E(\text{level})$: Tentative 2694 level in (n, γ) may correspond to this level.
2733.1 6	$3/2^-$ #	<31 fs	BCD	$T_{1/2}$: From $\tau < 0.045$ ps (1978Ra13).
2891 1	$(9/2)^+$		C	$E(\text{level})$: Tentative 2889 level in ^{41}Cl β^- may correspond to this level.

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

E(level)@	$J^{\pi\ddagger}$	$T_{1/2}^{\dagger}$	XREF	Comments
2948.5 8	$3/2^{-}\#$	<62 fs	BCD	$T_{1/2}$: From $\tau < 0.09$ ps (1978Ra13).
3009.8 10	$3/2^{-}$	<111 fs	BCD	$T_{1/2}$: From $\tau < 0.16$ ps (1978Ra13).
3122 10			C	E(level): Tentative 3111 level in (n, γ) with a 3111 γ may correspond to this level.
3293 5	$1/2^{-}, 3/2^{-}$		C	E(level): Tentative 3279 level in (n, γ) decaying by a 3111 γ may correspond to this level. There is also a tentative 3293 level in $^{41}\text{Cl} \beta^{-}$.
3326.3 5	$1/2^{-}\#$	<17 fs	BCD	$T_{1/2}$: From $\tau < 0.025$ 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 3565 γ may correspond to this level.
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	$1/2^{-}$	21 fs 12	BCD	$T_{1/2}$: 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^{π} : 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	

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

E(level) [@]	J^π [†]	XREF	E(level) [@]	J^π [†]	XREF	E(level) [@]	XREF
5321 1	(5/2) ⁻	C	6310 1	5/2 ⁻	C	7282 10	C
5406 1	3/2 ⁻ , 7/2 ⁻	C	6345 1	(5/2) ⁻	C	7311 10	C
5438 1	5/2 ⁻	C	6375 10		C	7351 10	C
5486 1	7/2 ⁻	C	6419 10		C	7426 10	C
5529 10		C	6453 10		C	7480 10	C
5573 10		C	6475 1	5/2 ⁻	C	7524 10	C
5618 1	(5/2) ⁻	C	6512 1	5/2 ⁻	C	7595 10	C
5675 10		C	6564 1	(5/2 ⁻ , 7/2 ⁻)	C	7682 10	C
5711 1	(5/2 ⁻)	C	6614 1	(9/2 ⁺)	C	7725 10	C
5753 1	(7/2 ⁻ , 9/2 ⁺)	C	6672 10		C	7761 10	C
5789 1	5/2 ⁻	C	6726 10		C	7818 10	C
5821 1	5/2 ⁻ , 7/2 ⁻	C	6762 10		C	7872 10	C
5870 10		C	6797 10		C	7945 10	C
5920 1	(7/2) ⁻	C	6846 10		C	7998 10	C
5947 1		C	6903 10		C	8030 10	C
5986 1	(5/2) ⁻	C	6959 10		C	8103 10	C
6036 1	5/2 ⁻	C	7009 10		C	8153 10	C
6088 10		C	7049 10		C	8234 10	C
6132 1	5/2 ⁻	C	7106 10		C	8277 10	C
6197 1	5/2 ⁻	C	7170 10		C	8301 10	C
6280 1	5/2 ⁻	C	7220 10		C		

[†] From (d,p γ), unless otherwise stated.[‡] Except where noted, assignments are from L-transfer and Ay(θ) 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 $^{40}\text{Ar}(n,n)$: resonances dataset. $\gamma(^{41}\text{Ar})$

$E_i(\text{level})$	J^π_i	E_γ [†]	I_γ [‡]	E_f	J^π_f	Mult.	α [#]	Comments
167.11	5/2 ⁻	167.1 1	100	0	7/2 ⁻	[M1]	0.00251	$\alpha(K)=0.00230$ 4; $\alpha(L)=0.000191$ 3; $\alpha(M)=1.86\times 10^{-5}$ 3 B(M1)(W.u.)=0.0149 8 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 .
515.77	3/2 ⁻	348.7 2 516.0 3	28 4 100 4	167.11 5/2 ⁻ 0 7/2 ⁻		[E2]	4.49×10^{-4}	$\alpha(K)=0.000412$ 6; $\alpha(L)=3.39\times 10^{-5}$ 5; $\alpha(M)=3.30\times 10^{-6}$ 5 B(E2)(W.u.)=5.5 18
1033.94	3/2 ⁺	517.9 3	79 9	515.77 3/2 ⁻		[E1]	1.29×10^{-4}	$\alpha(K)=0.0001182$ 17; $\alpha(L)=9.68\times 10^{-6}$ 14; $\alpha(M)=9.43\times 10^{-7}$ 14 B(E1)(W.u.)=0.00036 +54-31 B(E1)(W.u.)=0.00010 +14-8
1353.71	3/2 ⁻	866.7 2 837.5 3 1186.6 1 1353.6 2	100 9 20 3 100 3 4 3	167.11 5/2 ⁻ 515.77 3/2 ⁻ 167.11 5/2 ⁻ 0 7/2 ⁻		[E1]		

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Adopted Levels, Gammas (continued)

$\gamma(^{41}\text{Ar})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	$\alpha^\#$	Comments
1504.8	(9/2 ⁻)	1504.8 6	100	0	7/2 ⁻			
1629.7	(11/2 ⁻)	1629.7 3	100	0	7/2 ⁻			
1867.99	1/2 ⁺	514.2 1	100 11	1353.71	3/2 ⁻	[E1]	1.31×10^{-4}	$\alpha(\text{K})=0.0001203$ 17; $\alpha(\text{L})=9.85 \times 10^{-6}$ 14; $\alpha(\text{M})=9.61 \times 10^{-7}$ 14 $\text{B}(\text{E1})(\text{W.u.}) > 4.2 \times 10^{-5}$
		833.8 2	54 11	1033.94	3/2 ⁺			
		1353.3 3	60 11	515.77	3/2 ⁻	[E1]	1.77×10^{-4}	$\alpha(\text{K})=1.571 \times 10^{-5}$ 22; $\alpha(\text{L})=1.283 \times 10^{-6}$ 18; $\alpha(\text{M})=1.252 \times 10^{-7}$ 18 $\alpha(\text{IPF})=0.0001598$ 23 $\text{B}(\text{E1})(\text{W.u.}) > 1.4 \times 10^{-6}$
2397.9	1/2 ⁻	1044.3 4	100 7	1353.71	3/2 ⁻			
		1881.5 10	47 7	515.77	3/2 ⁻			
		2229.5 20	7 3	167.11	5/2 ⁻	[E2]		I_γ : other: 23 in (n, γ). $\text{B}(\text{E2})(\text{W.u.})=0.46$ 24
2733.1	3/2 ⁻	864	<5.4	1867.99	1/2 ⁺			
		1380	9 5	1353.71	3/2 ⁻			
		2566.1 8	100 5	167.11	5/2 ⁻			
2948.5	3/2 ⁻	1593 @	<8	1353.71	3/2 ⁻			
		2432.5 8	58	515.77	3/2 ⁻			I_γ : average of (n, γ) and (d,p γ).
		2781.8 15	100	167.11	5/2 ⁻			
3009.8	3/2 ⁻	2842.6 10	100	167.11	5/2 ⁻			
3326.3	1/2 ⁻	1458	8.5 24	1867.99	1/2 ⁺			E_γ : from (d,p γ) only.
		1972.7 12	13.0 24	1353.71	3/2 ⁻			
		2291.7 20	3.4	1033.94	3/2 ⁺			E_γ, I_γ : from (n, γ) only.
		2810.6 8	100.0 24	515.77	3/2 ⁻			
		3159	<9	167.11	5/2 ⁻			E_γ : from (d,p γ) only.
3968.1	1/2 ⁻	2614.4 8	100	1353.71	3/2 ⁻			
		3451.8 10	69	515.77	3/2 ⁻			I_γ : from (n, γ).
4270.0	3/2 ⁻	4102.7 15	100	167.11	5/2 ⁻			

[†] 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.

[#] [Additional information 1.](#)

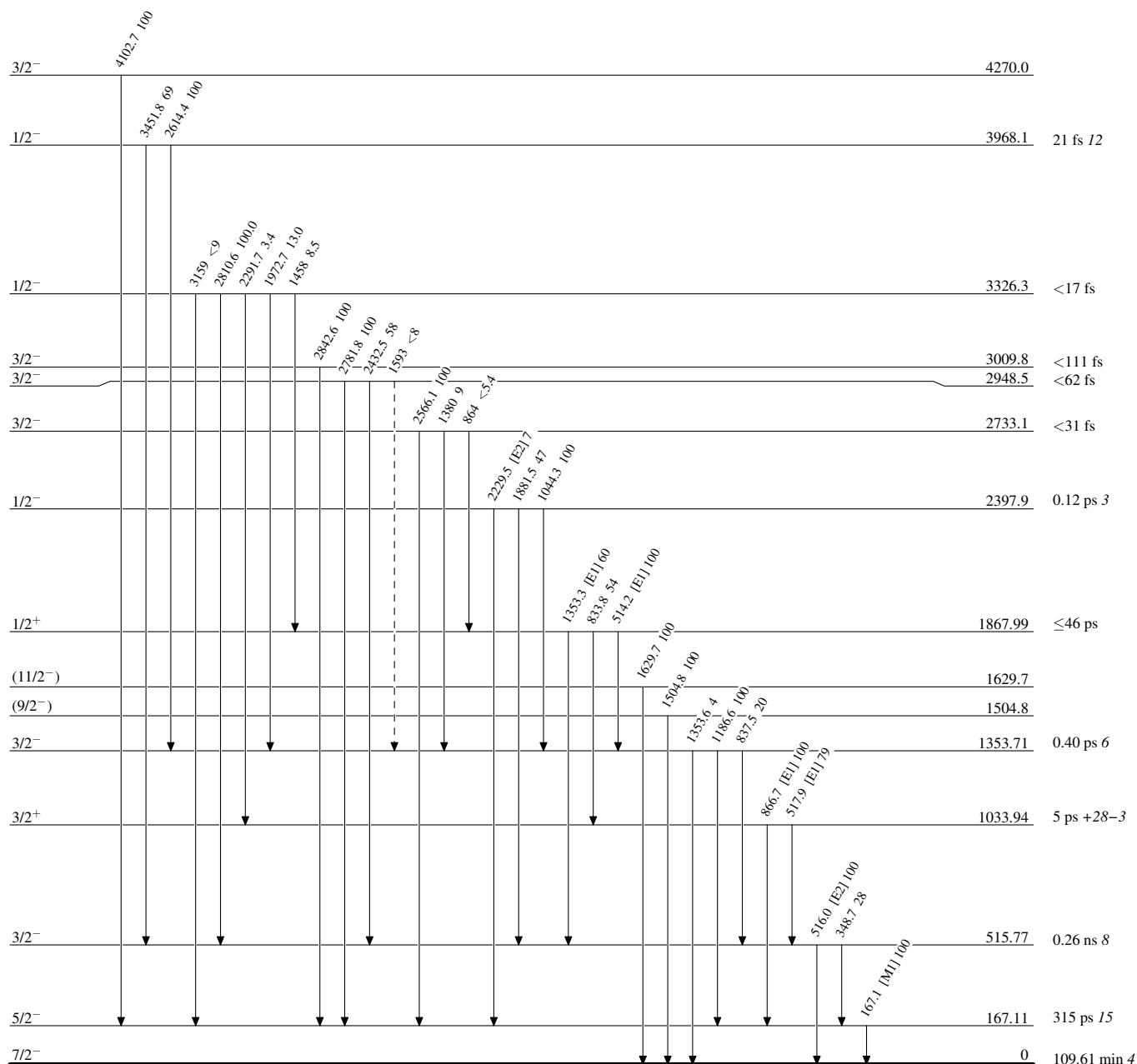
@ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain) $^{41}_{18}\text{Ar}_{23}$