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

History

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

Parent: ^{41}Cl: E=0; $J^\pi=(1/2^+)$; $T_{1/2}$=38.4 s *8*; Q(β^-)=5760 *70*; %β^- decay=100.0

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. Eγ, Iγ, $\beta\gamma$(t) were measured using fast timing detectors consisting of two BaF_2 crystals and $LaBr_3$(Ce) crystal, and two Ge detectors. Advanced Time Delayed $\beta\gamma\gamma$(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 Eγ, Iγ, $\gamma\gamma$-coin., $\gamma\beta$-coin., γ-γ-t using Ge(Li) detectors and 4π plastic beta counter. A scintillation telescope was used to measure β energy distributions. Eγ and Iγ 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}Ta(^{40}Ar, ^{41}Cl) at EMSONHIB at JINR. Measured Eγ, Eβ, 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^π‡	$T_{1/2}$#	Comments
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 Eγ's for levels ≤ 1868 keV.

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

From advanced time delayed $\beta\gamma\gamma$(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,pγ). 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).

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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(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(1.08×10^3[‡] *7*)	4683?			Iβ^-: 0.2 (1981HuZT).
(1.21×10^3[‡] *7*)	4553?			Iβ^-: 0.3 (1981HuZT).
(1.32×10^3[‡] *7*)	4439?			Iβ^-: 0.3 (1981HuZT).
(1.40×10^3[‡] *7*)	4359?			Iβ^-: 1 (1981HuZT).
(1.61×10^3[‡] *7*)	4148?			Iβ^-: 0.7 (1981HuZT).
(1.68×10^3[‡] *7*)	4084?			Iβ^-: 0.3 (1981HuZT).
(1.84×10^3[‡] *7*)	3922?			Iβ^-: 13 (1981HuZT).
(2.47×10^3[‡] *7*)	3293?			Iβ^-: 11 (1981HuZT).
(2.52×10^3[‡] *7*)	3237?			Iβ^-: 0.4 (1981HuZT).
(2.87×10^3[‡] *7*)	2889?			Iβ^-: 2.4 (1981HuZT).
(2.92×10^3[‡] *7*)	2842?			Iβ^-: 0.6 (1981HuZT).
(3.40×10^3[‡] *7*)	2363?			Iβ^-: 2.6 (1981HuZT).
(3.73×10^3[‡] *7*)	2035?			Iβ^-: 3 (1981HuZT).
(3.89×10^3 *7*)	1867.77	90 *10*	5.01 *6*	av Eβ=1733 *34* Iβ^-: from evaluators with reference to the value >80% given in 1974Gu10. 63 (1981HuZT). E(decay): Other: 3800 *150* from $\beta\gamma$ (1974Gu10).
(4.19×10^3[‡] *7*)	1567?			Iβ^-: <0.4 (1981HuZT).
(4.41×10^3[‡] *7*)	1353.63			Iβ^-: <18 (1981HuZT).
(4.73×10^3[‡] *7*)	1033.89			Iβ^-: <8 (1981HuZT).
(5.24×10^3[‡] *7*)	516.02			Iβ^-: <4 (1981HuZT).
(5.59×10^3[‡] *7*)	167.10			Iβ^-: <8 (1981HuZT).

[†] Absolute intensity per 100 decays.
[‡] Existence of this branch is questionable.

$\gamma(^{41}Ar)$

$\gamma\gamma$ 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$_i$(level)	J$_i^\pi$	E$_\gamma$[†]	E$_f$	J$_f^\pi$	Mult.[c]	α[d]	Comments
167.10	5/2$^-$	167.1[&] *1*	0	7/2$^-$	[M1]	0.00251	α(K)=0.00230 *4*; α(L)=0.000191 *3*; α(M)=1.86×10^{-5} *3* 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	3/2$^-$	348.7[&] *2*	167.10	5/2$^-$			Mult.: Admixture of M1 and E2 cannot be ruled out with pure B(E2) about 11 W.u.
		516.0[a#] *3*	0	7/2$^-$	[E2]	4.49×10^{-4}	α(K)=0.000412 *6*; α(L)=3.39×10^{-5} *5*; α(M)=3.30×10^{-6} *5*

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

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

E_i(level)	J_i^π	E_γ[†]	E_f	J_f^π	Mult.[c]	α[d]	Comments
							E_γ: Observed as a multiplet at 514.2, 516.0 and 517.9 keV in 2007Wh01.
1033.89	3/2$^+$	517.9[a] *3*	516.02	3/2$^-$	[E1]	1.29×10^{-4}	α(K)=0.0001182 *17*; α(L)=9.68×10^{-6} *14*; α(M)=9.43×10^{-7} *14*
		866.7[&] *2*	167.10	5/2$^-$	[E1]		
		1034[‡@be]	0	7/2$^-$			
1353.63	3/2$^-$	837.5[&] *3*	516.02	3/2$^-$	[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*	167.10	5/2$^-$	[M1]	4.03×10^{-5} *6*	α=4.03×10^{-5} *6*; α(K)=3.24×10^{-5} *5*; α(L)=2.65×10^{-6} *4*; α(M)=2.58×10^{-7} *4* α(IPF)=4.98×10^{-6} *7* 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[a] *2*	0	7/2$^-$	[E2]	7.59×10^{-5} *11*	α=7.59×10^{-5} *11*; α(K)=3.09×10^{-5} *5*; α(L)=2.53×10^{-6} *4*; α(M)=2.47×10^{-7} *4* α(IPF)=4.22×10^{-5} *6* E_γ: Observed as a doublet at 1351.3 and 1353.6 keV in 2007Wh01.
1567?		533[b]	1033.89	3/2$^+$			
		1400[b]	167.10	5/2$^-$			
		1567[b]	0	7/2$^-$			
1867.77	1/2$^+$	514.2[&] *1*	1353.63	3/2$^-$	[E1]	1.31×10^{-4}	α(K)=0.0001203 *17*; α(L)=9.85×10^{-6} *14*; α(M)=9.61×10^{-7} *14*
		833.8[&] *2*	1033.89	3/2$^+$			
		1351.3[&] *3*	516.02	3/2$^-$	[E1]	1.76×10^{-4}	α(K)=1.575×10^{-5} *22*; α(L)=1.286×10^{-6} *18*; α(M)=1.255×10^{-7} *18* α(IPF)=0.0001584 *23*
		1701[‡@be]	167.10	5/2$^-$			
2035?		681[e]	1353.63	3/2$^-$			
		1001[e]	1033.89	3/2$^+$			
		1519[e]	516.02	3/2$^-$			
		1868[e]	167.10	5/2$^-$			
2363?		796[e]	1567?				
		1329[e]	1033.89	3/2$^+$			
		1847[e]	516.02	3/2$^-$			
		2196[e]	167.10	5/2$^-$			
2842?		1275[e]	1567?				
		2842[e]	0	7/2$^-$			
2889?	(9/2)$^+$	1322[e]	1567?				
		1535[e]	1353.63	3/2$^-$			
		1855[e]	1033.89	3/2$^+$			
		2373[e]	516.02	3/2$^-$			
		2889[e]	0	7/2$^-$			
3237?		2203[e]	1033.89	3/2$^+$			
		3237[e]	0	7/2$^-$			
3293?		930[e]	2363?				
		1425[e]	1867.77	1/2$^+$			
		1726[e]	1567?				
		2777[e]	516.02	3/2$^-$			

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

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

E_i(level)	J_i^π	E_γ †	E_f	J_f^π
3293?		3293[e]	0	$7/2^-$
3922?		1033[e]	2889?	$(9/2)^+$
		1559[e]	2363?	
		2054[e]	1867.77	$1/2^+$
		2355[e]	1567?	
		2568[e]	1353.63	$3/2^-$
		3406[e]	516.02	$3/2^-$
		3755[e]	167.10	$5/2^-$
		3922[e]	0	$7/2^-$
4084?		3568[e]	516.02	$3/2^-$
4084?		4084[e]	0	$7/2^-$
4148?		3114[e]	1033.89	$3/2^+$
		3632[e]	516.02	$3/2^-$
		3981[e]	167.10	$5/2^-$
		4148	0	$7/2^-$
4359?		1517[e]	2842?	
		2324[e]	2035?	
		2792[e]	1567?	
		3325[e]	1033.89	$3/2^+$
		3843[e]	516.02	$3/2^-$
4359?		4192[e]	167.10	$5/2^-$
		4359[e]	0	$7/2^-$
4439?		3085[e]	1353.63	$3/2^-$
		4439[e]	0	$7/2^-$
4553?		1664[e]	2889?	$(9/2)^+$
		4553[e]	0	$7/2^-$
4683?		3329[e]	1353.63	$3/2^-$
		4167[e]	516.02	$3/2^-$
		4683[e]	0	$7/2^-$

† 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.
[a] From Adopted Gammas.
[b] Not reported in 2007Wh01.
[c] From Adopted Levels.
[d] Additional information 1.
[e] Placement of transition in the level scheme is uncertain.

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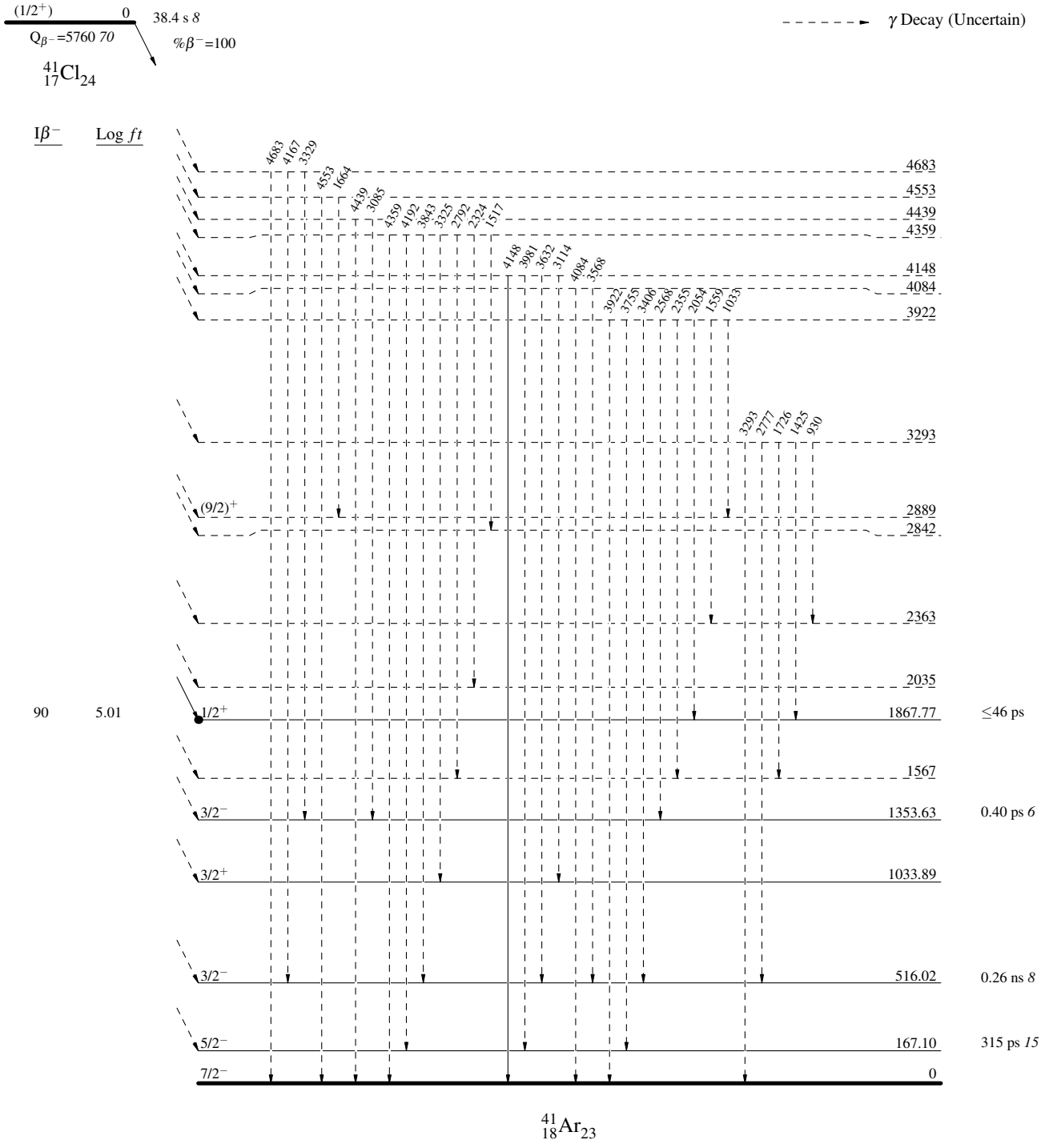
Decay Scheme



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Legend

Decay Scheme (continued)