

^{45}Cl β^- decay 2004Mr01,2003Gr22,1998WiZV

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows	NDS 109, 171 (2008)	30-Oct-2007

Parent: ^{45}Cl : $E=0.0$; $J^\pi=(1/2^+)$; $T_{1/2}=413$ ms 25; $Q(\beta^-)=1.141\times 10^4$ 12; $\% \beta^-$ decay=100.0

^{45}Cl - $E, J^\pi, T_{1/2}$: From the ^{45}Cl Adopted Levels.

^{45}Cl - $Q(\beta^-)$: From 2003Au03.

^{45}Cl - $\% \beta^-$ decay: From the ^{45}Cl Adopted Levels.

1998WiZV: $\text{Be}(^{48}\text{Ca}, X)$ $E=70$ MeV/A and 80 MeV/A. Mixed-particle beam produced by fragmentation of ^{48}Ca beams provided by the K1200 cyclotron At the NSCL of Michigan State University on 254 mg/cm² and 376 mg/cm² Be targets, respectively. Ions identified with a thin Si detector before implantation into Al targets. Measured γ 's and $\gamma\gamma$ - and $\beta\gamma\gamma$ -coincidences. Changes In the beam-on/beam-off timing cycle and beam-line tuning allowed association of γ 's to specific decays and $T_{1/2}$ measurements.

2004Mr01, 2003Gr22: $\text{Be}(^{48}\text{Ca}, X)$ $E=60$ MeV/A. LISE3 spectrometer At GANIL used to select $^{44,45,46}\text{Cl}$ isotopes that were purified by Wien-Filter. Isotopes implanted into double-sided Si detector with 16 \times 16 strips of 3 mm Γ . Detected β^- 's (2 plastic scintillators), γ 's and $\gamma\gamma$ -coincidences (2 coaxial 70% HPGe and 1 EXOGAM four-fold clover detector), N's (TONNERRE array), and $n\gamma$ -coincidences.

All data are from 2004Mr01, except As noted.

 ^{45}Ar Levels

E(level) [†]	J^π [‡]	$T_{1/2}$	Comments
0.0	$7/2^-$	21.48 s 15	$\% \beta^- = 100$ $T_{1/2}, \% \beta^-$: from the Adopted Levels.
542.1 6	$(3/2^-)$		
1339.9 [#] 8	$(3/2^-)$		
1416.1 [#] 12			
1734.7 9			
1770.3 8			
2757.0? 12			
3294.8 8			
3949.7? 12			
4326.1 9			

[†] From least-squares fit to $E\gamma$'s assuming $\Delta E(\gamma)=1$ keV when not given (evaluator).

[‡] As quoted by 2004Mr01. Not adopted by the evaluator.

[#] See footnote on $E\gamma(798\gamma, 874\gamma)$.

 β^- radiations

$I\beta$ normalization: decay scheme considered too incomplete by the evaluator to attempt normalization.

E(decay)	E(level)	$I\beta^-$ ^{†‡}
$(7.08\times 10^3$ 12)	4326.1	5.5
$(7.46\times 10^3$ [#] 12)	3949.7?	1
$(8.12\times 10^3$ 12)	3294.8	58.9 19
$(8.65\times 10^3$ [#] 12)	2757.0?	1
$(9.64\times 10^3$ 12)	1770.3	19
$(9.68\times 10^3$ 12)	1734.7	13.2 8
$(9.99\times 10^3$ 12)	1416.1	4.2 15

Continued on next page (footnotes at end of table)

^{45}Cl β^- decay 2004Mr01,2003Gr22,1998WiZV (continued) β^- radiations (continued)

E(decay)	E(level)	$I\beta^{-\dagger\ddagger}$
$(1.007 \times 10^4 \text{ } 12)$	1339.9	3.9 <i>11</i>
$(1.087 \times 10^4 \text{ } 12)$	542.1	11.3 <i>10</i>

\dagger Relative feeding from intensity balance.

\ddagger Absolute intensity per 100 decays.

Existence of this branch is questionable.

 $\gamma(^{45}\text{Ar})$

I γ normalization: decay scheme considered too incomplete by the evaluator to attempt normalization.

E_γ	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. \ddagger	α^b	Comments
541.7 ^{#@} 7	100	542.1	(3/2 ⁻)	0.0	7/2 ⁻	(E2)	3.84×10^{-4} 5	$\alpha=3.84 \times 10^{-4}$ 5; $\alpha(\text{K})=0.000352$ 6; $\alpha(\text{L})=2.90 \times 10^{-5}$ 5; $\alpha(\text{M})=2.82 \times 10^{-6}$ 5
797.7 ^{@&}	4	1339.9	(3/2 ⁻)	542.1	(3/2 ⁻)			
874.0 ^{@&}	2.7	1416.1		542.1	(3/2 ⁻)			
^x 1157.5 [#] 7								
1192.6 [#] 7	14	1734.7		542.1	(3/2 ⁻)			
1228.1 ^{#@} 7	36	1770.3		542.1	(3/2 ⁻)			
1340 [@]	3.4	1339.9	(3/2 ⁻)	0.0	7/2 ⁻			
1416.1 ^{@ac}	3	1416.1		0.0	7/2 ⁻			
1524.4 [#] 7	17	3294.8		1770.3				
1560.2 ^c	1.6	3294.8		1734.7				
1955.1 ^c	2.1	3294.8		1339.9	(3/2 ⁻)			
2214.8 ^c	1	2757.0?		542.1	(3/2 ⁻)			
2751 [#] 2	28	3294.8		542.1	(3/2 ⁻)			
2986.2	2.5	4326.1		1339.9	(3/2 ⁻)			
3295.2 ^a	12	3294.8		0.0	7/2 ⁻			
3407.5 ^c	1	3949.7?		542.1	(3/2 ⁻)			
3783.8 ^a	3	4326.1		542.1	(3/2 ⁻)			

\dagger Relative intensity.

\ddagger From the Adopted Gammas.

From 1998WiZV.

@ Also seen In ^{46}Cl β^- n decay.

& Coincidences of the 798 and 874 γ 's with the 542 γ . However, 798 and 874 γ 's are also weakly coincident with the 1228 γ . In ^{46}Cl decay the 798 γ is 50% more intense than the 1228 γ while In ^{45}Cl decay $I_\gamma(1228\gamma)$ is about 10 times $I_\gamma(798)$. $I_\gamma(874\gamma)$ behaves In a similar fashion. Therefore, 2004Mr01 suggest two states, 1340 and 1417, and leave open a possibility of a doublet and unseen transition.

^a Placed In the decay scheme using a sum rule.

^b Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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

^x γ ray not placed in level scheme.

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