

^{45}Ar β^- decay [1980Hu01](#),[1978Pe04](#),[1974TiZW](#)

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

Parent: ^{45}Ar : $E=0.0$; $J^\pi=5/2^-,7/2^-$; $T_{1/2}=21.48$ s 15; $Q(\beta^-)=6844.8$ 8; $\% \beta^-$ decay=100.0

^{45}Ar -E, J^π , $T_{1/2}$: From ^{45}Ar Adopted Levels.

^{45}Ar - $Q(\beta^-)$: From ^{45}Ar Adopted Levels.

[1974TiZW](#) measured γ 's and $\gamma(t)$ (11 γ 's. See $\gamma(^{45}\text{Ca})$ from ^{45}K β^- decay and table below).

[1978Pe04](#) measured γ 's and $\gamma(t)$ (61 γ ,1020 γ ,1808 γ ,2687 γ +3707 γ).

[1980Hu01](#) measured $T_{1/2}(^{45}\text{Ar}$ g.s.) (multiscaling of β^- emission) and γ 's, $\gamma\gamma$ -coincidences, and $\gamma\gamma(t)$ (high-efficiency Ge(Li)).

 ^{45}K Levels

[1980Hu01](#) disagree with existence of states At 1808 and 2357 proposed by [1974TiZW](#) and [1978Pe04](#).

E(level) [†]	J^π [‡]	$T_{1/2}$ [#]	Comments
0.0	$3/2^+$	17.81 min 61	$\% \beta^- = 100$ $T_{1/2}, \% \beta^-$: from the Adopted Levels. probably $(\pi d_{3/2})^{-1}$ (1978Pe04). probably $(\pi s_{1/2})^{-1}$ (1978Pe04).
474.45@ 14	$1/2^+$		
1020.03@ 4	$(3/2,5/2,7/2^+)$	<0.7 ns	
1081.38 5	$(5/2^-,7/2^-)$	3.2 ns 4	
1424.3 3	$1/2,3/2,5/2^{(+)}$		
1473.9 3		≤ 0.7 ns	
1639.15 7			
1722.6 3			
2188.22 8			1980Hu01 confirm state postulated by 1978Pe04 through $\gamma\gamma$ -coin.
2517.0 3			
2568.7 4			
2747.9 6			
2786.6?& 6			
3311.24 21			
3398.3?& 6			
3707.2 3			
3996.62 13			
4044.0 10			
4357.3 4			
4569.1 10			

[†] From least-squares fit to $E\gamma$'s.

[‡] From the Adopted Levels. See [1980Hu01](#) for other suggested J^π based on the assumption that $J^\pi(^{45}\text{Ar}$ g.s.)= $(7/2^-)$.

[#] From $\gamma\gamma(t)$ ([1980Hu01](#)).

@ Possible intensity imbalance problem.

& Tentative placement. The sum of the 597.8 and 1209.5 γ 's is 1807.3, an energy At which a γ is observed and assigned to the crossover transition 3.99-2.19 MeV; As there is No further evidence, the intermediate state could Be At 2.79 or 3.40 MeV.

⁴⁵Ar β⁻ decay **1980Hu01,1978Pe04,1974TiZW** (continued)

β⁻ radiations

log ft(α) log f^{lu}t_{≥8.5}.

E(decay)	E(level)	Iβ ⁻ #	Log ft	Comments
(2275.7 13)	4569.1	0.53 10	6.0 1	av Eβ=954.83 61
(2487.5 9)	4357.3	2.0 5	5.6 1	av Eβ=1055.13 43
(2800.8 13)	4044.0	0.27 5	6.7 1	av Eβ=1204.51 62
(2848.2 8)	3996.62	23 4	4.8 1	av Eβ=1227.19 39
(3137.6 9)	3707.2	41 8	4.7 1	av Eβ=1366.11 42
(3446.5 @ 10)	3398.3?	<0.4	>6.9	av Eβ=1515.15 49
(3533.6 8)	3311.24	0.47 21	6.9 2	av Eβ=1557.25 40
(4058.2 @ 10)	2786.6?	<0.2	>7.5	av Eβ=1811.68 49
(4096.9 10)	2747.9	0.94 21	6.9 1	av Eβ=1830.5 49
(4276.1 9)	2568.7	0.52 21	7.2 2	av Eβ=1917.73 44
(4327.8 9)	2517.0	1.8 5	6.7 2	av Eβ=1942.92 42
(4656.6 @ 8)	2188.22	<0.076	>8.2	av Eβ=2103.29 40
(5122.2 9)	1722.6	0.87 17	7.3 1	av Eβ=2330.88 42
(5205.6 8)	1639.15	3.3 8	6.8 1	av Eβ=2371.71 40
(5370.9 9)	1473.9	0.30 18	7.9 3	av Eβ=2452.61 42
(5420.5 @ 9)	1424.3	0.4 3	7.8 4	av Eβ=2476.91 42
(5763.4 8)	1081.38	14 3	6.4 1	av Eβ=2644.95 40
(6370.3 † 8)	474.45	1.4 4	7.6 2	av Eβ=2942.73 40
(6844.8 8)	0.0	<25 ‡	>6.4	av Eβ=3175.74 40

† If Jπ(⁴⁵Ar g.s.)=7/2⁻, the 474 state should not be fed.

‡ No direct measurement was made. An upper limit was estimated by 1980Hu01 from ⁴⁵K buildup.

Absolute intensity per 100 decays.

@ Existence of this branch is questionable.

γ(⁴⁵K)

I_γ normalization: 0.0292 ≤ I_γ normalization ≤ 0.0389 8 from 75 ≤ Σ I_γ (to g.s.) ≤ 100.

1980Hu01 †	TVSummary of E _γ 's (I _γ 's)	and	discrepant placements
1978Pe04	1974TiZW		
61.33 ‡ 5 (715 18)	61.39 15 (787 150)		
474.5 2 (69.8)	474.0 6 (67 45)		474.4 2 (40 2)
549.1 1 (79 7)	549.03 15 (87 13)		549.1 2 (83 10)
TVAssigned to 2358 by			
1978Pe04 suggested			TV1974TiZW.
doublet with other			TVa
at 2358.			TVplacement
557.8 1 (64 6)	557.7 4 (50 16)		557.6 2 (67 4)
TVUnplaced by 1974TiZW.			
619.3 2 (87 7)	619.15 20 (106 24)		619.3 2 (72 4)
1019.9 1 (1000)	1020.05 6 (1000 67)		1020.09 8 (1000 40)
1081.2 2 (37 § 18)	1081.3 5 (86 28)		
1106.6 1 (310 7)	1106.85 13 (339 35)		1106.92 10 (355 14)
TVAssigned to 1107 by 1974TiZW.			
1546.2 7 (25.2 15)	1548.4 17 (20 14)		1548.7 2 (92 4)
1638.4 1 (273 9)	1639.0 4 (266 52)		1639.1 1 (266 10)
1807.8 1 (382 14)	1808.41 20 (386 44)		1808.58 8 (396 16)
TVAssigned by 1974TiZW and			

1808. TV1978Pe04 to
 2357.4 2 (227 4) 2357.7 5 (287 40) 2357.4 2 (232 10)
 TVAssigned by 1974TiZW and

2358. TV1978Pe04 to
 2687.7 5 (179 17) 2687.1 7 (356 108)
 3706.7 2 (964 27) 3706.8 7 (860 150) 3707.2 1 (807 40)
 † TVΔI_γ were estimated by evaluator from uncertainty in branching ratios given by 1980Hu01.
 TVWhere no ΔI_γ are given, 3% was assumed for purposes of the analysis.
 ‡ TVDetermined with an intrinsic Ge detector (Be window).

E _γ [†]	I _γ ^{‡g}	E _i (level)	J _i ^π	E _f	J _f ^π	Mult.#	α [@]	Comments
61.34 5	735 11	1081.38	(5/2 ⁻ ,7/2 ⁻)	1020.03	(3/2,5/2,7/2 ⁺)	D	0.07 3	α(K)=0.060 24; α(L)=0.0051 20; α(M)=0.00055 21; α(N+..)=2.0×10 ⁻⁵ 8 α(N+..)=2.0×10 ⁻⁵ 8
474.43 15	70 7	474.45	1/2 ⁺	0.0	3/2 ⁺			
549.08 8	81 5	2188.22		1639.15				
557.76 9	66 3	1639.15		1081.38	(5/2 ⁻ ,7/2 ⁻)			
597.8 ^{h&ai} 5	9.6 ^{h&}	2786.6?		2188.22				
597.8 ^{h&ai} 5	9.6 ^{h&}	3996.62		3398.3?				
^x 609.0 1	9.1							
619.25 12	84 7	1639.15		1020.03	(3/2,5/2,7/2 ⁺)			
685.3 2	36 5	3996.62		3311.24				
845.4 ^b 10	8.8 15	2568.7		1722.6				
949.8 3	28.4 3	1424.3	1/2,3/2,5/2 ⁽⁺⁾	474.45	1/2 ⁺			
1020.04 5	1000 23	1020.03	(3/2,5/2,7/2 ⁺)	0.0	3/2 ⁺	D,E2		
1042.8 3	25 4	2517.0		1473.9				
^x 1053.7 5	11.1							
1081.21 19	75 23	1081.38	(5/2 ⁻ ,7/2 ⁻)	0.0	3/2 ⁺	D,Q,(E3)	7.×10 ⁻⁵ 4	α=7.E-5 4; α(K)=6.E-5 4; α(L)=5.E-6 3; α(M)=6.E-7 4; α(N+..)=2.1×10 ⁻⁸ 12 α(N+..)=2.1×10 ⁻⁸ 12
1106.82 8	341 11	2188.22		1081.38	(5/2 ⁻ ,7/2 ⁻)			
1123.1 5	39.4 16	3311.24		2188.22				
1138.2 5	19 5	3707.2		2568.7				
^x 1142.5 ^c 12	10.7							
^x 1168.5 ^d 5	10.2							
^x 1172.7 3	23.9							
1209.5 ^{h&ai} 4	14.7 ^{h&}	3398.3?		2188.22				
1209.5 ^{h&ai} 4	14.7 ^{h&}	3996.62		2786.6?				
1323.2 6	11.2 26	2747.9		1424.3	1/2,3/2,5/2 ⁽⁺⁾			
1424.4 5	18.6 3	1424.3	1/2,3/2,5/2 ⁽⁺⁾	0.0	3/2 ⁺			
1434.8 10	27 6	2517.0		1081.38	(5/2 ⁻ ,7/2 ⁻)			
1473.6 3	41.8	1473.9		0.0	3/2 ⁺	D,Q		
^x 1485.9 7	9.7							
1548.5 5	25.6 15	2568.7		1020.03	(3/2,5/2,7/2 ⁺)			
1638.81 22	271 7	1639.15		0.0	3/2 ⁺			
1670.7 8	10.4 17	3311.24		1639.15				
1722.5 3	34.3	1722.6		0.0	3/2 ⁺			
1808.38 16	389 10	3996.62		2188.22				
1840.1 5	22 4	4357.3		2517.0				
2283.2 7	24 7	3707.2		1424.3	1/2,3/2,5/2 ⁽⁺⁾			
2357.43 ^b 15	232 6	3996.62		1639.15				
^x 2489.6 9	16.7							
2517.9 5	24 4	2517.0		0.0	3/2 ⁺			
^x 2549.6 ^e 9	18.6							
2687.5 ^f 4	182 17	3707.2		1020.03	(3/2,5/2,7/2 ⁺)			
2749.8 15	16.5 26	2747.9		0.0	3/2 ⁺			

$\times 2796.6^e$ 5	34.4		
2885.0 20	8 3	4357.3	1473.9
3338.1 10	15 5	4357.3	1020.03 (3/2,5/2,7/2 ⁺)
3703.2 13	979 27	3707.2	0.0 3/2 ⁺
3995.3 15	8.2 20	3996.62	0.0 3/2 ⁺

Continued on next page (footnotes at end of table)

${}^{45}\text{Ar}$ β^- decay 1980Hu01,1978Pe04,1974TiZW (continued) $\gamma({}^{45}\text{K})$ (continued)

E_γ^\dagger	I_γ^\ddagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π
4043.8 10	7.9	4044.0		0.0	3/2 ⁺
4356.0 10	13 3	4357.3		0.0	3/2 ⁺
4568.9 10	15.6	4569.1		0.0	3/2 ⁺

[†] From 1980Hu01 or weighted average of data summarized above.

[‡] From 1980Hu01 or analysis of data summarized above using the computer code gamut (1990FiZZ). I_γ of 1980Hu01 were modified slightly As a result of the analysis. ΔI_γ were estimated by evaluator from uncertainty In branching ratios given by 1980Hu01; where No ΔI_γ are given, 3% was assumed for purposes of the analysis.

From comparison to RUL.

@ From the Adopted Gammas.

& Not included In the analysis.

^a See footnote on 2787 or 3398 state.

^b Singles spectra contaminated by background activities (1980Hu01).

^c Possible coincidence with 549 γ .

^d Possible coincidence with 1107 γ .

^e Possible coincidence with 1020 γ .

^f Coincidence with 511 γ (not assigned to ${}^{45}\text{Ar}$ β^- decay).

^g For absolute intensity per 100 decays, multiply by 0.034 6.

^h Multiply placed with undivided intensity.

ⁱ Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

⁴⁵Ar β⁻ decay 1980Hu01,1978Pe04,1974TiZW

Decay Scheme

Legend

Intensities: I_(γ+ce) per 100 parent decays
& Multiply placed: undivided intensity given

- I_γ < 2% × I_γ^{max}
- I_γ < 10% × I_γ^{max}
- I_γ > 10% × I_γ^{max}
- - - - - γ Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)

