^{48}K β^- decay 1981HuZT,1975Mu08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 179, 1 (2022)	30-Nov-2021

Parent: ^{48}K: E=0.0; $J^\pi=1^{(-)}$; $T_{1/2}$=6.8 s *2*; Q(β^-)=11940.4 *8*; %β^- decay=100.0

^{48}K-J^π,$T_{1/2}$: From Adopted Levels of ^{48}K.

^{48}K-Q(β^-): From 2021Wa16.

1975Mu08: ^{48}K activity was produced via ^{48}Ca(n,p) with neutrons from the Livermore high-flux facility on a target of 106-mg 96.3% enriched ^{48}Ca metal foil. β particles were detected with a Pilot B detector and γ rays were detected with a Ge(Li) detector. Measured Eγ, Iγ, Eβ, Iβ, $\beta\gamma$-coin. Deduced levels, J, π, β-decay branching ratios, log *ft*. Assignments of γ transitions other than the 3832γ are based on $T_{1/2}$ agreement and that these transitions do not belong to ^{16}N. Report levels up to 7400.

1981HuZT: ^{48}K activity was produced via ^{48}Ca(n,p) with E=14 MeV neutron beam from ISOLDE on a ^{48}Ca target. γ rays were detected with a Ge(Li) detector (FWHM=4 keV at 1.33 MeV) and a NaI(Tl) detector. Measured Eγ, Iγ, $\gamma\gamma$-coin, γ(t), $\gamma\gamma$(t). Deduced levels, J, π, parent $T_{1/2}$, β-decay branching ratios, log *ft*. Report levels up to 11032.

All information for the bound states is from 1975Mu08, except as noted, and all information for the unbound states (S(n)=9945 *4*) is from 1981HuZT.

^{48}Ca Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]	E(level)[†]	J^π[‡]
0.0	0^+	2.9×10^{19} y *+42−11*	8531?[#]	(1,2)
3831.72 *6*	2^+		8967?[#]	(1,2,3)
4284?[#]	0^+		9301[#@]	1^-[@]
4502.99 *13*	4^+		9985	4^+
4506.90 *7*	3^-		10077[a]	$(4)^+$,$(3)^-$[a]
4611.88 *9*	$3^{(+)}$		10123	1^-
5262?[#]	$4^{(-)}$		10180	3^-
5369.59 *8*	3^-		10240?	
6614.2 *5*	1^-		10269	$(^-)$[&]
6685.25 *10*	$2^{(-)}$		10354	$(1^+,2^+)$
6895.09 *9*	(2^-)		10378	$(2)^+$
7301.5 *5*	1^-		10614	3^-
7400.87 *11*	(2^-)		10662	
7407.3?[#] *5*	$(0,1,2,3^-)$		10826	3^-
7658[#]	3^-		10917	$(3)^-$
8391[#]	1^-		11032?	$(^-)$[&]
8467?[#]	(1,2,3)			

[†] From 1975Mu08 up to 7400 and from 1981HuZT above that, unless otherwise noted. Note that E(level) values from 1975Mu08 and 1981HuZT are based on their measured γ-ray energies, which however are not reported.

[‡] From Adopted Levels, except as noted.

[#] Existence suggested by 1981HuZT.

[@] Unresolved doublet corresponding to adopted 9292, 1^-, and 9295, 2^+.

[&] Suggested by 1981HuZT.

[a] Unresolved doublet corresponding to adopted 10065, $(4)^+$, and 10080, $(3)^-$.

^{48}K β^- decay 1981HuZT,1975Mu08 (continued)

β^- radiations

E(decay)	E(level)	Iβ^-[@]	Log *ft*	Comments
(908.4[&] *8*)	11032?	0.08	5.0	
(1023.4 *8*)	10917	0.08	5.1	
(1114.4 *8*)	10826	0.06	5.4	
(1278.4 *8*)	10662	0.04	5.8	
(1326.4 *8*)	10614	0.19	5.2	
(1562.4 *8*)	10378	0.04	6.1	
(1586.4 *8*)	10354	0.02	6.4	
(1671.4 *8*)	10269	0.15	5.6	
(1700.4[&] *8*)	10240?	0.06	6.1	
(1760.4 *8*)	10180	0.22	5.6	
(1817.4 *8*)	10123	0.02	6.6	
(1863.4 *8*)	10077	0.08	6.1	
(1955.4 *8*)	9985	0.08	6.2	
(2639.4[&] *8*)	9301	0.46[†]	5.9	
(2973.4[&] *8*)	8967?	0.11[†]	6.8	
(3409.4[&] *8*)	8531?	0.56[†]	6.3	
(3473.4[&] *8*)	8467?	1.50[†]	5.9	
(3549.4[&] *8*)	8391	0.38[†]	6.6	
(4282.4 *8*)	7658	0.78[†]	6.6	
(4533.1[&] *10*)	7407.3?	3.3[†]	6.1	
(4539.5 *8*)	7400.87	22.5 *12*	5.25 *3*	Iβ=11.62, log *ft*=5.5 from 1981HuZT are discrepant.
(4638.9 *10*)	7301.5	2.4 *7*	6.3 *2*	Iβ=35.15, log *ft*=5.1 from 1981HuZT are discrepant.
(5045.3 *8*)	6895.09	20.8 *14*	5.48 *4*	Iβ=9.16, log *ft*=5.8 from 1981HuZT are discrepant.
(5255.2 *8*)	6685.25	15.6 *14*	5.7 *1*	Iβ=5.6, log *ft*=6.1 from 1981HuZT are discrepant.
(5326.2 *10*)	6614.2	12 *4*	5.8 *2*	Iβ=20.38 from 1981HuZT is discrepant.
(6570.8 *8*)	5369.59	3.8 *18*	6.7[‡] *2*	Iβ=0.38, log *ft*=7.7 from 1981HuZT are discrepant.
(6678.4[&] *8*)	5262?	0.14[†]	8.2[‡]	
(7328.5 *8*)	4611.88	9.6 *20*	6.6[‡] *1*	Iβ=1.15, log *ft*=7.5 from 1981HuZT are discrepant.
(7433.5 *8*)	4506.90	2.2 *16*	7.2[‡] *4*	Iβ<0.3, log *ft*>8.1 from 1981HuZT are discrepant.
(7437.4[&] *8*)	4502.99	<1.0	>9.7[1*u*]	
(7656.4[&] *8*)	4284?	<0.15[†]	>10.6[1*u*]	
(8108.7 *8*)	3831.72	6.2 *23*	6.9[‡] *2*	
(11940.4[&] *8*)	0.0	<1.0[#]	>11[1*u*]	

[†] From 1981HuZT.
[‡] log $f^{1u}t$>8.5.
[#] From singles measurement (1975Mu08).
[@] Absolute intensity per 100 decays.
[&] Existence of this branch is questionable.

^{48}K β^- decay 1981HuZT,1975Mu08 (continued)

$\gamma(^{48}Ca)$

Iγ normalization, I(γ+ce) normalization: From ΣI(γ+ce to g.s.)=98.4% *5*, deduced from %Iβ(to g.s.)<1 (1975Mu08) and adopted %β^-n=1.14 *15* (1982Ca04).

E_γ †	I_γ @ e	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	δ ‡	$I_{(\gamma+ce)}$ e	Comments
452 &g	<2.5 a	4284?	0^+	3831.72	2^+	(E2)			
648.4 ‡g *1*	0.30	5262?	$4^{(-)}$	4611.88	$3^{(+)}$	(E1)			I_γ: from Iγ(755γ)=1.8 and adopted branching ratio.
671.26	45 *5*	4502.99	4^+	3831.72	2^+	E2			
675.17	216 b *8*	4506.90	3^-	3831.72	2^+	(E1(+M2))	0.00 *3*		
715.61	17 *5*	7400.87	(2^-)	6685.25	$2^{(-)}$				I_γ: other: I(715.6γ)/I(2788.9γ)=4/76 (1981HuZT).
755 &g	1.8 &	5262?	$4^{(-)}$	4506.90	3^-	(M1)			
757 &	12.0 *7*	5369.59	3^-	4611.88	$3^{(+)}$	(E1)			I_γ: from Iγ(1538γ)=189 *11* in 1975Mu08 and branching ratios of 1981HuZT.
780.15	398 *20*	4611.88	$3^{(+)}$	3831.72	2^+	(M1)			
x793.11 f# *6*	81 f# *8*								
793.11 f#g *6*	42 f#	7407.3?	$(0,1,2,3^-)$	6614.2	1^-				
862.68	55 *8*	5369.59	3^-	4506.90	3^-	D,E2			
866.59	43 *8*	5369.59	3^-	4502.99	4^+	(E1)			
1315.64	163 b *13*	6685.25	$2^{(-)}$	5369.59	3^-	D,E2			
1525.47	50 *8*	6895.09	(2^-)	5369.59	3^-	(M1)			
1537.84	189 *11*	5369.59	3^-	3831.72	2^+	(E1)			
1932 &	0.16 c	7301.5	1^-	5369.59	3^-				
2031.23	37 *5*	7400.87	(2^-)	5369.59	3^-				I_γ: other: I(2031.2γ)/I(2788.9γ)=10/76 (1981HuZT).
2073.32	24 b *7*	6685.25	$2^{(-)}$	4611.88	$3^{(+)}$	(E1)			
2178.30	30 b *6*	6685.25	$2^{(-)}$	4506.90	3^-	D,E2			
2283.15	32 *6*	6895.09	(2^-)	4611.88	$3^{(+)}$	[E1]			
2388.13	137 *10*	6895.09	(2^-)	4506.90	3^-	(M1)			
2689 &	0.16 c	7301.5	1^-	4611.88	$3^{(+)}$				
2788.90	207 *12*	7400.87	(2^-)	4611.88	$3^{(+)}$				
2894 &	10.9 d	7400.87	(2^-)	4506.90	3^-				
3063.27	48 *9*	6895.09	(2^-)	3831.72	2^+				
3569 &	13.6 d	7400.87	(2^-)	3831.72	2^+				
3831.56	1000	3831.72	2^+	0.0	0^+	E2			
4247 &g	1.4 &	8531?	(1,2)	4284?	0^+				
(4284 ‡)		4284?	0^+	0.0	0^+	E0		<0.8 a	$I_{(\gamma+ce)}$: from Iγ(452γ)<2.5 and adopted branching ratio.
4506.67	47 b *12*	4506.90	3^-	0.0	0^+	E3			
(4554 ‡)	0.48	8391	1^-	3831.72	2^+	(E1)			I_γ: from Iγ(8390γ)=4.9 and adopted branching ratio.
4635 &g	16.6 &	8467?	(1,2,3)	3831.72	2^+				

^{48}K β^- decay 1981HuZT,1975Mu08 (continued)

$\gamma(^{48}Ca)$ (continued)

E_γ †	I_γ @ e	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	E_γ †	I_γ @ e	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡
4699 & g	3.6 &	8531?	(1,2)	3831.72	2^+		8390 &	4.9 &	8391	1^-	0.0	0^+	E1
6613.7	170 *10*	6614.2	1^-	0.0	0^+	E1	8466 & g	2.6 &	8467?	(1,2,3)	0.0	0^+	
7300.9	31 *8*	7301.5	1^-	0.0	0^+		8530 & g	2.2 &	8531?	(1,2)	0.0	0^+	
7400 &	2.7 d	7400.87	(2^-)	0.0	0^+		8966 & g	1.4 &	8967?	(1,2,3)	0.0	0^+	
(7651 ‡)		7658	3^-	0.0	0^+		9300 &	5.9 &	9301	1^-	0.0	0^+	E1

† From level-energy differences, except as noted.
‡ From Adopted Gammas.
# From L.G. Multhauf (priv.comm. to 1978De17). Placement from 7407 suggested by 1981HuZT. Iγ=123 *8* for doublet suitably divided assuming Iγ=42 from 7407 (based on net feeding to 7407 and branching ratios of 1981HuZT).
@ From 1975Mu08, unless otherwise noted.
& Reported by 1981HuZT; not reported by 1975Mu08. Eγ deduced from level-energy difference (by the evaluator); Iγ and I(γ+ce), from branching ratios of 1981HuZT and level feedings.
a From the adopted branching ratios and net feeding to level.
b Iγ(1316γ):Iγ(2073γ):Iγ(2178γ)=80%:15%:5% and Iγ(675γ)/Iγ(4507γ)=2.70 (1981HuZT) discrepant.
c From Iγ(7301γ)=31 *8* and branching ratios of 1981HuZT.
d From Iγ(2789γ)=207 *12* and branching ratios of 1981HuZT.
e For absolute intensity per 100 decays, multiply by 0.0780 *17*.
f Multiply placed with intensity suitably divided.
g Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

$^{48}_{20}Ca_{28}$-4

^{48}K β^- decay 1981HuZT,1975Mu08

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
@ Multiply placed: intensity suitably divided

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

$1^{(-)}$ 0.0 6.8 s 2
Q_{β^-}=11940.4 8 $\%\beta^-$=100
$^{48}_{19}K_{29}$

Iβ⁻	Log *ft*		
0.08	5.0	$(^-)$	11032
0.08	5.1	$(3)^-$	10917
0.06	5.4	3^-	10826
0.04	5.8		10662
0.19	5.2	3^-	10614
0.04	6.1	$(2)^+$	10378
0.02	6.4	$(1^+,2^+)$	10354
0.15	5.6	$(^-)$	10269
0.06	6.1		10240
0.22	5.6	3^-	10180
0.02	6.6	1^-	10123
0.08	6.1	$(4)^+,(3)^-$	10077
0.08	6.2	4^+	9985
0.46	5.9	1^-	9301
0.11	6.8	(1,2,3)	8967
0.56	6.3	(1,2)	8531
1.50	5.9	(1,2,3)	8467
0.38	6.6	1^-	8391
0.78	6.6	3^-	7658
3.3	6.1	$(0,1,2,3^-)$	7407.3
22.5	5.25	(2^-)	7400.87
2.4	6.3	1^-	7301.5
20.8	5.48	(2^-)	6895.09
15.6	5.7	$2^{(-)}$	6685.25
12	5.8	1^-	6614.2
3.8	6.7	3^-	5369.59
0.14	8.2	$4^{(-)}$	5262
9.6	6.6	$3^{(+)}$	4611.88
2.2	7.2	3^-	4506.90
<1.0	>9.7[1u]	4^+	4502.99
<0.15	>10.6[1u]	0^+	4284
6.2	6.9	2^+	3831.72
<1.0	>11[1u]	0^+	0.0

9300 E1 0.460
8966 0.1092
8530 0.172
4699 0.281
4247 0.1092
8466 0.203
4635 1.29
8390 E1 0.382
4554 (E1) 0.0374
7651
793.11 3.28@
7400 0.211
3569 1.061
3894 0.850
2788 90 16.1
2031.23 2.9
715.61 1.3
7300.9 2.4
2689 0.0125
1932 0.0125
3063.27 3.7
2388.13 (M1) 10.7
2283.15 (E1)12.5
1525.47 (M1) 3.9
2178.30 D,E2 2.3
2073.32 (E1) 1.9
1315.64 D,E2 12.7
6613.7 E1 13.3
1537.84 (E1) 14.7
866.59 (E1) 3.4
862.68 D,E2 4.3
757 (E1) 0.94
755 (M1) 0.140
648.4 (E1) 0.0234
780.15 (M1) 31.0
4506.67 E3 3.7
675.17 (E1+M2)) 16.8
671.26 E2 3.5
4284 E0 ≤0.062
452 (E2) ≤0.195
3831.56 E2 78.0

2.9×10[19] y +42−11

$^{48}_{20}Ca_{28}$