Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 190,1 (2023)	20-Jun-2023

Q(β^-)=5687.2 *5*; S(n)=7277.4 *6*; S(p)=11061 *5*; Q(α)=−10650 *30* 2021Wa16
S(2n)=16902.1 *4*, S(2p)=25530 *60* (2021Wa16).
Mass measurements: 2012La05, 2007Ya08.
Other measurements:
Reaction cross sections and radii for f-p shell nuclei: 1997Li15.
Giant resonances: 1988Vo06.
Isotope shifts and hyperfine structure: 2021Ko08, 2019Ko19, 2014Pa45, 2014Kr04, 1982To02, 1982Du06.
1999Ai02: ^{44}K beam from ^{55}Mn fragmentation, Si(^{44}K,X) studied.
Additional information 1.
^{44}Ca(n,p): 1999Ar19, 1988Ma53, 1986Pe06, 1985Gu17, 1977Mo05, 1968Le25.
Theoretical structure calculations:
2022Do01: calculated odd-even staggering of binding energy, and charge radius.
1980Jo09: calculated levels, J^π, B(M1), magnetic moment using shell model.
Other theoretical calculations: seven other references for structure and two for radioactive decays retrieved from the NSR database (www.nndc.bnl.gov/nsr/) are listed in document records which can be accessed via web-based ENSDF database.

^{44}K Levels

Cross Reference (XREF) Flags

- A ^{44}Ar β^- decay (11.87 min)
- B ^{44}Ca(t,^{3}He)
- C ^{48}Ca(p,$\alpha n\gamma$)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
0.0	2−	22.13 min *19*	ABC	%β^-=100 μ=−0.856 *4* (1982To02,1982Du06,2019StZV) Evaluated rms charge radius (<r^2>)$^{1/2}$=3.456 fm *10* (2013An02). Evaluated change in charge radius δ<r^2>(^{39}K,^{44}K)=+0.148 fm^2 *11* (2013An02). Jπ: spin from laser spectroscopy (1982To02,1982Du06); parity from allowed β^- decay to π=− level at 5561 (log *ft*=4.5 *+5−2*); fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations and assumed L=1+3 suggests 2−, although with a poor fit. $T_{1/2}$: weighted average of 22.0 min *5* (1954Co70) and 22.15 min *20* (1973In02). Others: 1961Hi17, 1960Su05, 1954An25, 1937Wa06. μ: from laser spectroscopy: 1982To02, 1982Du06. See also 2019StZV compilation. Other: −0.8567 *43* from laser spectroscopy in 2014Pa45. Measured δ<r^2>(^{47}K,^{44}K)=+0.036 fm^2 *5*(stat) *51*(syst) from $\delta\nu$(^{47}K,^{44}K)=−292.1 MHz *5*(stat) *10*(syst) (2014Kr04). Measured δ<r^2>(^{39}K,^{44}K)=0.163 fm^2 *7*(stat) *60* (syst) from $\delta\nu$(^{39}K,^{44}K)=565.1 MHz *8* (2021Ko08); δ<r^2>(^{47}K,^{44}K)=0.0464 fm^2 *51*(stat)*21*(syst) from $\delta\nu$(^{47}K,^{44}K)=−293.19 MHz *56*(stat)*23*(syst) (2019Ko19).
182.64 *6*	(1−)	<0.9 ns	AB	Jπ: 1,2,3+ from 1703.4γ from 1+, 182.6γ to 2− not pure E2 from RUL; 1− predicted in shell-model calculations (1980Jo09). Level is weakly populated in (t,^{3}He).
382.85 *8*	(3−)	<0.7 ns	ABC	Jπ: fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations and assumed L=1+3 suggests 2−, but as stated by 1985Aj03, fits for 3+ and 3− could not be excluded; 1980Ma13 in (p,$\alpha n\gamma$) proposed (3−) based on shell-model calculations by 1980Jo09, and an analogous state at 587, 3− in ^{46}K. J^π=2− is unlikely as it would require 137.25γ from 520, (4−) level to be E2, with B(E2)≥1244, exceeding RUL=100.
520.09 *9*	(4−)	<0.7 ns	ABC	Jπ: from fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations and assumed L=3+5.

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Adopted Levels, Gammas (continued)

^{44}K Levels (continued)

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	XREF	Comments
				J^π=(4$^-$) also proposed in (p,αnγ) (1980Ma13) based on shell-model calculations in 1980Jo09, and an analogous state at 681, (4$^-$) in ^{46}K.
811.68 *13*	(5$^-$)		BC	J$^\pi$: from fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations and assumed L=5. J^π=(5$^-$) also proposed in (p,αnγ) (1980Ma13) based on shell-model calculations by 1980Jo09, and an analogous state at 885, 5$^-$ in ^{46}K.
968.96 *31*	(3)		BC	J$^\pi$: fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations and assumed L=2+4 suggests 3$^+$, but 3$^-$ is not completely excluded. Shell-model calculations predict 4$^-$ (1980Jo09).
1013.59 *12*	(4$^+$)		BC	XREF: B(1003). J$^\pi$: fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations and assumed L=4 suggests 4$^+$ more likely than 3$^-$, while excluding 3$^+$. Also, possible (4$^+$) from shell-model calculations (1980Jo09).
1051.30 *8*	(3$^-$)		AB	J$^\pi$: from fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations suggest (4$^+$,3$^-$); and 1051.3γ to 2$^-$. Also, 3$^-$ from shell-model calculations (1980Jo09).
1076.79 *7*	(2$^-$)		AB	J$^\pi$: from fit of σ(q) data in (t,^{3}He) with CCBA calculations and assumed L=1+3. Also, 2$^-$ from shell-model calculations (1980Jo09).
1241.04 *17*			C	J$^\pi$: 2$^-$,3,4,5$^-$ suggested from 227.4γ to (3$^-$) and 721.2γ to (4$^-$). Possible (5$^+$) from shell-model calculations (1980Jo09).
1367.94 *18*		<0.7 ns	C	J$^\pi$: 3$^-$,4,5,6,7$^-$ suggested from 556.3γ to (5$^-$). Possible (6$^+$) from shell-model calculations (1980Jo09).
1459.39 *7*	(1$^-$)		A	J$^\pi$: J=1 from allowed or forbidden (log *ft*=6.47) β^- transition from 0$^+$ parent; 1460.0γ to 2$^-$; negative parity from 408.1γ to (3$^-$).
1480 *10*	(1$^+$)		B	E(level): from energy consideration, this level may be the same as the 1459.39, (1$^-$) populated in ^{44}Ar β^- decay, but different J^π assignments suggest two different levels. J$^\pi$: from fit of $\sigma(\theta)$ data in (t,^{3}He) to CCBA calculations, excluding fit to L=1, J^π=1$^-$.
1500 *15*			B	
1886.05 *6*	1$^+$		A	J$^\pi$: allowed β feeding from 0$^+$ parent, with log *ft*=4.15.
1990 *20*			B	E(level): probable multiplet.
2060 *20*	(5$^+$,4$^-$)		B	E(level),J$^\pi$: fit of $\sigma(\theta)$ data in (t,^{3}He) with CCBA calculations for possible unresolved states.
2325.92 *18*	1$^+$		A	J$^\pi$: allowed β feeding from 0$^+$ parent, with log *ft*=4.87.
2574.11 *12*	1$^+$		A	J$^\pi$: allowed β feeding from 0$^+$ parent, with log *ft*=4.42.

[†] From a least-squares fit to γ-ray energies. In the fitting procedure, $\Delta E\gamma$ for 1460.0γ has been doubled so that the reduced χ^2 gets decreased to an acceptable value of 2.0 from 3.1.

[‡] For ten levels, J^π values from fits of experimental $\sigma(\theta)$ data in ^{44}Ca(t,^{3}He) reaction to CCBA (coupled-channel Born approximation) theoretical calculations with assumed L-transfers, using CHUCK computer code, are listed (1985Aj03).

[#] From $\gamma\gamma$(t) in (p,αnγ) (1980Ma13) for excited states.

$\gamma(^{44}K)$

E$_i$(level)	J$_i^\pi$	E$_\gamma$[†]	I$_\gamma$[†]	E$_f$	J$_f^\pi$	Mult.	α[#]	Comments
182.64	(1$^-$)	182.6 *1*	100	0.0	2$^-$	[M1+E2]	0.013 *10*	If M1, B(M1)(W.u.)>0.004. Multipolarity cannot be pure E2, since B(E2)(W.u.)>327 would exceed RUL=100.
382.85	(3$^-$)	382.84 *10*	100	0.0	2$^-$	[M1+E2]		E$_\gamma$: weighted average of 382.9 *1* from ^{44}Ar β^- decay and 382.70 *15* from (p,αnγ). If M1, B(M1)(W.u.)>5.6×10^{-4}. If E2, B(E2)(W.u.)>11.
520.09	(4$^-$)	137.25[‡] *5*	100.0 *7*	382.85	(3$^-$)	[M1]	0.00494 *7*	B(M1)(W.u.)>0.0084

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Adopted Levels, Gammas (continued)

γ(^{44}K) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.	Comments
							E_γ: other: 137.3 *3* from ^{44}Ar β^- decay.
							Mult.: multipolarity cannot be E2 as B(E2)(W.u.) would exceed RUL=100.
520.09	(4$^-$)	520.0 *2*	43.3 *7*	0.0	2$^-$	[E2]	B(E2)(W.u.)>0.65
							E_γ: weighted average of 519.4 *4* from ^{44}Ar β^- decay and 520.0 *1* from (p,αnγ).
							I_γ: other: 35 from (p,αnγ).
811.68	(5$^-$)	291.6‡ *1*	100	520.09	(4$^-$)		
968.96	(3)	586.1‡ *3*	100	382.85	(3$^-$)		
1013.59	(4$^+$)	202.7‡ *10*	<10‡	811.68	(5$^-$)		
		630.7‡ *1*	100‡	382.85	(3$^-$)		
1051.30	(3$^-$)	531.2 *3*	3.2 *6*	520.09	(4$^-$)		
		1051.3 *1*	100.0 *6*	0.0	2$^-$		
1076.79	(2$^-$)	693.8 *2*	24.6 *39*	382.85	(3$^-$)		
		894.2 *1*	68.5 *48*	182.64	(1$^-$)		
		1076.6 *1*	100.0 *54*	0.0	2$^-$		
1241.04		227.40‡ *15*	100‡	1013.59	(4$^+$)		
		721.2‡ *4*	43‡	520.09	(4$^-$)		
1367.94		126.9‡ *1*	100‡	1241.04			
		556.3‡ *3*	18‡	811.68	(5$^-$)		
1459.39	(1$^-$)	408.1 *1*	100.0 *38*	1051.30	(3$^-$)		
		1276.6 *1*	37.3 *27*	182.64	(1$^-$)		
		1460.0 *1*	52.8 *34*	0.0	2$^-$		E_γ: poor fit; level-energy difference=1459.37 *7*.
1886.05	1$^+$	426.7 *1*	4.58 *17*	1459.39	(1$^-$)		
		809.1 *1*	3.44 *33*	1076.79	(2$^-$)		
		1703.4 *1*	100.0 *38*	182.64	(1$^-$)		
		1886.1 *1*	55.6 *18*	0.0	2$^-$		
2325.92	1$^+$	866.1 *10*	100.0 *56*	1459.39	(1$^-$)		
		2143.5 *4*	48.4 *30*	182.64	(1$^-$)		
		2325.8 *2*	50.8 *30*	0.0	2$^-$		
2574.11	1$^+$	1114.7 *1*	100	1459.39	(1$^-$)		

† From ^{44}Ar β^- decay, unless otherwise noted.

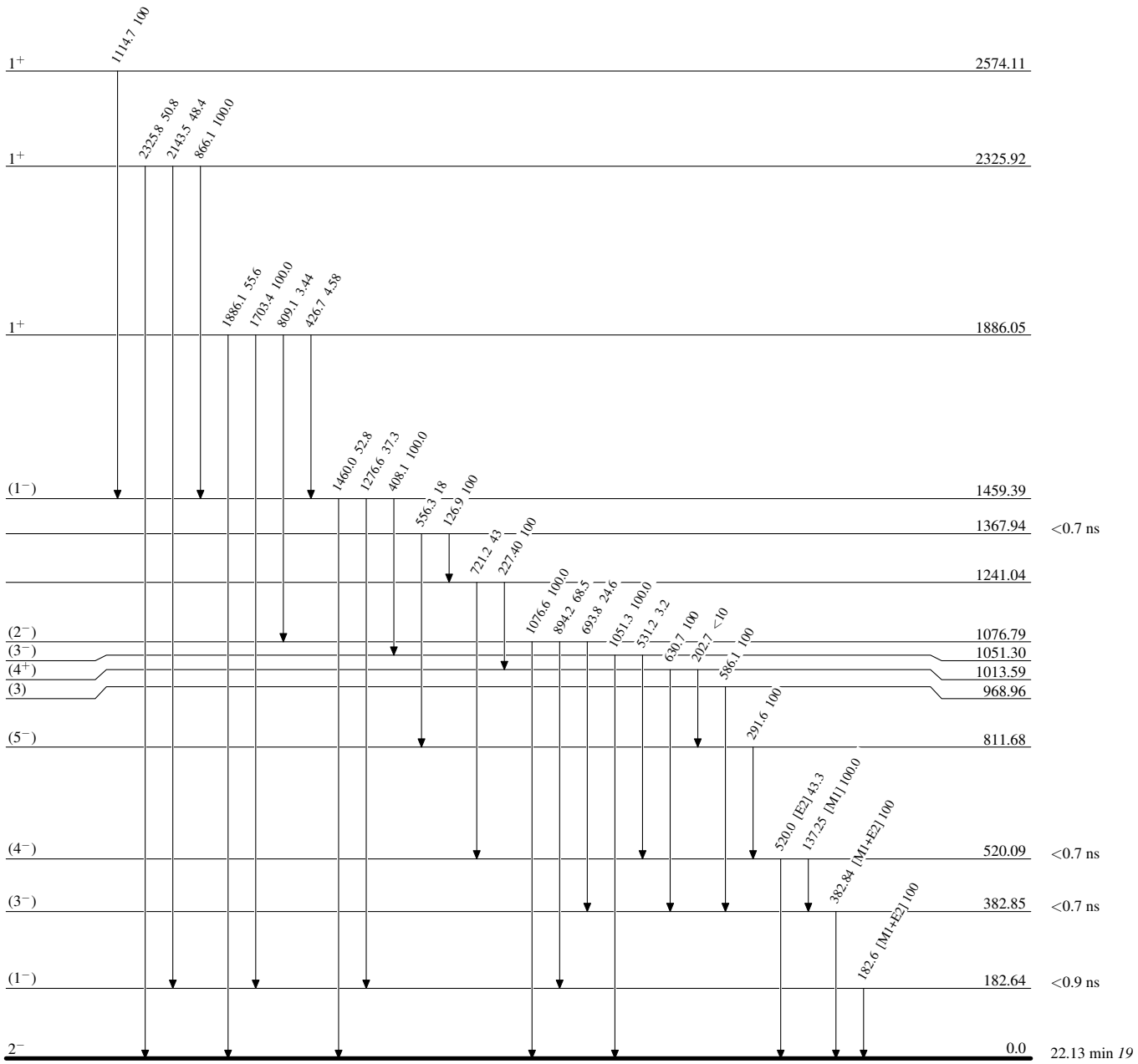
‡ From (α,pnγ).

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.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{44}_{19}K_{25}$