Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 152, 1 (2018)	30-Sep-2017

Q(β^-)=−6742.26 *6*; S(n)=12071.87 *22*; S(p)=5142.06 *28*; Q(α)=−6785.59 *20* 2017Wa10
Q(β^+)=5914.07 *4*, S(2n)=27526.3 *4*, S(2p)=13856.69 *20* (2017Wa10).
First identification of ^{38}K nuclide by 1937Hu01, according to the 2012Th10 compilation of isotope discoveries.
Mass measurements: 2011Er02, 2007Ya08.
Hyperfine structure: 2014Pa45, 2014Kr04, 2014Bi10.

^{38}K Levels

Cross Reference (XREF) Flags

A	^{38}Ca ε decay (443.76 ms)	G	^{38}Ar(p,n)	M	^{40}Ca(μ^-,ν2nγ)
B	^{38}K IT decay (924.4 ms)	H	^{38}Ar(^{3}He,t)	N	^{40}Ca(π^-,2n),(π^-,2nγ)
C	^{24}Mg(^{16}O,pnγ)	I	^{39}K(p,d)	O	^{40}Ca(p,^{3}He)
D	^{35}Cl(α,nγ)	J	^{39}K(d,t)	P	^{40}Ca(d,$\alpha\gamma$)
E	^{36}Ar(^{3}He,pγ)	K	^{39}K(^{3}He,$\alpha\gamma$)	Q	^{40}Ca(d,α),(pol d,α)
F	^{36}Ar(α,d)	L	^{39}K(^{3}He,α)	R	^{40}Ca(α,^{6}Li)

Isospin T=1 (triplet) states

^{38}Ar	^{38}Ca	ΔE(1)	^{38}K	ΔE(2)
0,0$^+$	0,0$^+$	130,0$^+$ T=1		
2167,2$^+$	2213,2$^+$ +46	2401,2$^+$ T=1	+104,+58	
3377,0$^+$	3084,0$^+$ -293			
3810,3$^-$	3704,3$^-$ -106			
3937,2$^+$	3684,2$^+$ -253			

ΔE(1)=E(^{38}Ca)-E(^{38}Ar)
ΔE(2)=E(^{38}K)-E(^{38}Ar)-130, E(^{38}K)-E(^{38}Ca)-130

E(level)†	J$^\pi$	T$_{1/2}$‡	XREF	Comments
0	3$^+$	7.651 min *19*	ABCDEFGHIJKLMNOPQR	%ε+%β^+=100 μ=+1.371 *6* (1982To02,2014StZZ) J$^\pi$: spin from atomic-beam magnetic resonance (1965Ph02) and fitting of hyperfine structure (2014Pa45,2014Kr04); parity from L(^{3}He,α)=L(d,t)=L(p,d)=2 from 3/2$^+$. T$_{1/2}$: unweighted average of 7.67 min *3* (1957Cl23), 7.67 min *5* (1965Bo42), 7.70 min *2* (1965Eb01), 7.60 min *4* (1967Va27), and 7.613 min *11* (1970Re13). Others: 7.4 min *9* (2000Le02); 7.4 m *13* (1968Ka15); 6.5 m *15* (1965Ph02); 7.0 m *10*, Nucl. Phys. 41, 364 (1963); 7.7 m *3* (1956Gr07); Phys. Rev. 72, 639 (1947); 7.7 m *1* (1937Ri01); 7.7 m *1* (1937Hu01). μ: atomic beam method (1982To02). Other: +1.3735 *10* (1965Ph02), +1.3711 *69* (2014Pa45). See also 2014StZZ compilation. <r^2>$^{1/2}$=3.426 fm *5* (2013An02 evaluation). Additional information 1.
130.22 *16*	0$^+$	924.4 ms *3*	ABCDE GHIJKLM OPQ	%IT=0.0330 *43* (2008Le12); %ε+%β^+=99.9670 *43* T=1 J$^\pi$: L(^{3}He,t)=L(p,^{3}He)=0 from 0$^+$; superallowed β transition from 0$^+$; analog of g.s. of ^{38}Ar and ^{38}Ca. T$_{1/2}$: 924.41 ms *21* from average of 929.2 ms *35* (1972Ha82), 925.6 ms *7* (1975Sq01), 922.3 ms *11* (1976Wi08), 921.71 ms *65*

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Adopted Levels, Gammas (continued)

^{38}K Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
				(1978Wi04), 928.8 ms *20* (1978Th02), 924.15 ms *31* (1983Ko22), 924.4 ms *6* (2000Bb01), 924.46 ms *14* (2010Ba43), using the Normalised Residual Method (NRM) with a reduced χ^2=2.9, and weighted average gives 924.35 *25* with a reduced χ^2=4.4. The evaluator has adopted 924.4 ms *3* by considering results from both methods. Others (in ms): 948 *10* (1961Ja22); 938 *8* (1960Ja12); 944 *12* (1960Li05); 970 *7* (Nucl. Phys. 7, 296 (1958)); 951 *7* (1957Cl23); 1954Kl36; Phys. Rev. 92, 1076 (1953).
458.53 *16*	1^+	7.0 ps *6*	A CDEFGHIJKLM OPQR	Jπ: L(pol d,α)=2 and analyzing power; 328.1γ ΔJ=1 to 0^+. $T_{1/2}$: from Recoil Distance Method (RDM) in (^{16}O,pnγ). Others: <35 ps from (α,nγ), >2.8 ps from (d,αγ). Additional information 2.
1697.65 *25*	1^+	48 fs *10*	A C EFGHIJKLM OPQR	Jπ: L(d,α)=L(p,^{3}He)=0+2 from 0^+; unnatural parity from (pol d,α); 1567.4γ ΔJ=1 to 0^+. $T_{1/2}$: from DSAM, weighted average of 37 fs *17* from (^{3}He,αγ) and 52 fs *10* from (d,αγ). Additional information 3.
2401.12 *19*	2^+	52 fs *15*	C E HIJKLM OPQ	T=1 Jπ: L(p,d)=L(d,t)=0+2 from $3/2^+$; natural parity from (pol d,α); J=2 from γ(θ) in (d,αγ). $T_{1/2}$: from DSAM, weighted average of 37 ps *17* from (^{3}He,αγ) and 63 fs *15* (d,αγ).
2613.01 *15*	3^-	6 ps *+5–2*	C Ef hI M PQ	Jπ: L(p,d)=3 from $3/2^+$ and natural parity from (pol d,α) gives 1^-,3^-,5^-; 2613.0γ to 3^+ and RUL rules out 1^- and 5^-.
2646.19 *15*	$(4)^-$	0.98 ns *10*	CDEf hIJ LMNOPQ	XREF: L(2638). Jπ: L(p,d)=3 from $3/2^+$ and unnatural parity from (pol d,α) gives 2^-,4^-; 4^- is supported by $J^\pi=(7)^+$ assignment for 3458 level; but 2^- is supported by L(p,^{3}He)=1+3 from 0^+ and L(d,t)=1 from $3/2^+$ for the 2613+2646 doublet and is not completely ruled out. $T_{1/2}$: from γ(t) in (^{16}O,pnγ).
2827.4 *6*	1^-	0.22 ps *5*	C Ef HI PQ	XREF: C(?). Jπ: L(p,d)=1+3 from $3/2^+$ and natural parity from (pol d,α) gives 1^-,3^-,5^-; 2697.9γ to 0^+ and RUL rules out 3^- and 5^-. But L(^{3}He,t)=(2,4) from 0^+ is inconsistent.
2869.2 *5*	2^-	3.1 ps *8*	C Ef I L OPQ	XREF: C(?)L(2856). Jπ: L(d,α)=1+3 from 0^+ and L(^{3}He,α)=L(p,d)=1+3 from $3/2^+$ and unnatural parity from (pol d,α).
2993.0 *4*	0^-	114 fs *30*	A C E PQ	XREF: A(?)C(?). Jπ: from tensor analyzing power in (pol d,α); J=0,1 from γ(θ) in (d,αγ).
3040 *15*			Q	
3315.4 *7*	$(1^+,2^-,3^+)$	1.70 ps *29*	C E I OPQ	XREF: C(?). Jπ: unnatural parity from (pol d,α); J=1,2,3 from γ(θ) in (d,αγ); L(p,^{3}He)=0+2 or 1+3 suggests 1^+,2^-.
3341.1 *8*	1^+	<38 fs	A C E GHI PQ	XREF: C(?)G(3400). Jπ: L(p,d)=0+2 from $3/2^+$; unnatural parity from (pol d,α).
3420.07 *17*	$(6)^{-@}$	70 ps *10*	CD L PQ	Jπ: ΔJ=2, E2 γ to $(4)^-$. $J^\pi=4^-$ if J(2646)=2^- is not completely ruled out. $T_{1/2}$: from RDM in (^{16}O,pnγ).
3429.7 *10*	2^+	<0.12 ps	E hIj OPQ	XREF: P(?). Jπ: L(p,d)=0+2 from $3/2^+$; natural parity from (pol d,α); J=2 from γ(θ) in (^{3}He,pγ).
3458.10 *17*	$(7)^+$	21.95 μs *11*	CD FGh j Q	%IT=100

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Adopted Levels, Gammas (continued)

^{38}K Levels (continued)

E(level)†	Jπ	$T_{1/2}$‡	XREF	Comments
				μ=+3.836 *14* (1974Io01) Jπ: L(α,d)=6 for a 3445 *50* group is consistent with 3458 level rather than 3431 level and gives J^π=5+,6+,7+; unnatural parity from (pol d,α) rules out 6+; J=7 is favored by measured magnetic moment and shell-model predictions. J=5 (for J(2646)=2) is not completely ruled out. $T_{1/2}$: from timing in pulsed beam method using reaction ^{24}Mg(^{16}O,npγ) (1980Jo11). Other: 22.3 μs *4* (1983Va05), 22.5 μs *6* (1974Ya04), and 22.1 μs *7* (1974Va13) in (^{16}O,npγ), 22.1 μs *7* (1975Io01) in (α,nγ). μ: from g-factor=+0.548 *2* measured using TDPAD method (1974Io01). μ=+2.740 *10* if J(3458)=5.
3614.6 *5*	(3,5)−	0.5 ps *+6−2*	E I PQ	Jπ: L(p,d)=3 from 3/2+; J=(3,5) from $\gamma(\theta)$ in (^{3}He,pγ) if J(2646)=4; possible natural parity from (pol d,α). But 1086.3γ from (1+,2+) disfavors 5−.
3668.1 *5*	3+	91 fs *35*	Ef h PQ	Jπ: L(d,α)=2+4 from 0+; J=1,3 from $\gamma(\theta)$ in (d,$\alpha\gamma$).
3687.6 *9*	(3)	0.28 ps *+11−8*	Ef h PQ	Jπ: 3690γ to 3+, 1074.3γ to 3− and RUL gives J=(2,3,4); J=(3,5) from $\gamma(\theta)$ in (^{3}He,pγ) if J(2646)=4. Note that J(2646)=2 is not completely ruled out.
3703.7 *4*	(1+,2,3+)	>0.76 ps	Ef hI L OPQ	Jπ: L(p,d)=(0+2) suggests (1+,2+); L(p,^{3}He)=1+3 or 2+4 suggests (2−,3+).
3738.8 *15*	(1+ to 5+)		EF Q	E(level): from 1975Co09 in (^{3}He,pγ). 1975Co09 also report 3738.9 *17* from (d,α) measurement. Jπ: 3739γ to 3+.
3790 *20*			Q	
3813.6 *7*	2−		E I PQ	Jπ: L(p,d)=1+3 from 3/2+; unnatural parity in (pol d,α).
3841.0 *17*			E ghI Q	E(level): weighted average of 3840 *3* from (^{3}He,pγ), 3842 *4* from (p,d), and 3841.2 *17* from (d,α),(pol d,α). Jπ: unnatural parity from (pol d,α).
3855.8 *19*	1+	<83 fs	A E ghI PQ	XREF: g(3900). Jπ: L(p,d)=0+2 from 3/2+; unnatural parity from (pol d,α).
3931.0 *6*	2−		E I PQ	Jπ: L(p,d)=1+3 from 3/2+; unnatural parity from (pol d,α).
3976.3 *12*	1+	<40 fs	A EFgHIJ L OPQ	XREF: g(3900)J(3989). Jπ: L(d,t)=L(^{3}He,α)=L(p,d)=0+2 from 3/2+; L(d,α)=L(p,^{3}He)=0+2 from 0+; unnatural parity from (pol d,α).
4174.9 *18*	(1)+		A E I l Q	T=0 E(level): weighted average of 4175.4 *18* from (^{3}He,pγ), 4176 *3* from (p,d), and 4173.8 *20* from (d,α),(pol d,α). Jπ: L(p,d)=0+2 from 3/2+; weak β feeding (log *ft*=5.3) from 0+.
4214.2 *17*	(1−)		E HI l Q	Jπ: 4085.9γ to 0+; L(p,d)=(1+3) from 3/2+.
4318.2 *21*	(1+ to 5+)		Ef I Q	XREF: f(4345). E(level): weighted average of 4317 *3* from (^{3}He,pγ), 4321 *4* from (p,d), and 4318.0 *21* from (d,α),(pol d,α). Jπ: 4318γ to 3+.
4333.4 *21*	(0− to 4−)	0.24 ps *+49−17*	Ef HI l PQ	XREF: f(4345)H(4340)l(4360). E(level): weighted average of 4331.0 *15* from (^{3}He,pγ) and (d,$\alpha\gamma$), 4338 *4* from (p,d), and 4336.7 *21* from (d,α),(pol d,α). Jπ: 402γ to 2−.
4394.7 *21*	(1+ to 5+)		Ef l Q	XREF: f(4345)l(4360). E(level): weighted average of 4394.3 *24* from (^{3}He,pγ)

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Adopted Levels, Gammas (continued)

^{38}K Levels (continued)

E(level)[†]	Jπ	XREF	Comments
			and 4395.0 *21* from (d,α),(pol d,α).
			Jπ: 4394γ to 3+.
4409.6 *13*	(0 to 3+)	E I Q	E(level): weighted average of 4409.2 *13* from (^{3}He,pγ), 4405 *4* from (p,d), and 4412.2 *22* from (d,α),(pol d,α).
			Jπ: 2712γ to 1+.
4451.7 *2*	2	Q	
4459.9 *2*	3	I Q	
4491.1 *26*		l Q	
4504.9 *23*		l Q	
4587.9 *22*		E Q	E(level): weighted average of 4587 *3* from (^{3}He,pγ) and 4588.3 *22* from (d,α),(pol d,α).
4598 *3*	1−,2−,3−	I	E(level): from (p,d).
			Jπ: L(p,d)=1+3 from 3/2+.
4616.0 *22*		h Q	
4641 *3*	(1 to 5)−	hIJ Q	XREF: J(4660).
			E(level): weighted average of 4646 *4* from (p,d) and 4639.0 *22* from (d,α),(pol d,α).
			Jπ: L(d,t)=3 from 3/2+.
4668 *3*	1+,2+	I L O Q	Jπ: L(^{3}He,α)=L(p,d)=0+2 from 3/2+.
			E(level): weighted average of 4662 *15* from (^{3}He,α), and 4664 *3* from (d,α),(pol d,α), 4673 *3* from (p,d) and 4671 *11* from (p,^{3}He).
4700.9 *9*	(1+,2+)	E HI PQ	Jπ: L(p,d)=(0+2) from 3/2+.
4723 *3*	(0 to 3+)	E Q	E(level): weighted average of 4724.4 *19* from (^{3}He,pγ) and 4718 *3* from (d,α),(pol d,α).
			Jπ: 1382γ to 1+.
4749.7 *25*		Q	
4806 *3*		Q	
4848 *4*		I Q	E(level): weighted average of 4853 *4* from (p,d) and 4845 *3* from (d,α),(pol d,α).
4901.2 *13*	(0+ to 4+)	E Q	Jπ: 2500γ to 2+.
4971 *3*		Q	
4989.9 *20*	1+,2+	E I Q	E(level): weighted average of 4988.7 *15* from (^{3}He,pγ), 4998 *4* from (p,d), and 4990 *3* from (d,α),(pol d,α).
			Jπ: L(p,d)=0+2 from 3/2+.
5047.8 *14*	(1 to 5)−	E I l Q	E(level): weighted average of 5047.5 *14* from (^{3}He,pγ) and 5049 *3* from (d,α),(pol d,α). Other: 5058 *4* from (p,d).
			Jπ: L(p,d)=3 from 3/2+.
5086 *3*		H l Q	
5104 *3*	(5+,6+,7+)	f Q	Jπ: L(α,d)=6 for a group at 5127 *50*.
5133.1 *15*	(0+ to 4+)	Ef Q	E(level): weighted average of 5133.8 *15* from (^{3}He,pγ), and 5131.3 *23* from (d,α),(pol d,α).
			Jπ: 2732γ to 2+.
5192 *3*		Q	
5216.4 *16*	(0 to 3+)	E	E(level): from (^{3}He,pγ).
			Jπ: 3519γ to 1+.
5253.7 *4*	(9+)#@	C	Jπ: 1795.6γ to (7)+.
5254 *4*	1+,2+	HI L Q	XREF: H(5260).
			E(level): weighted average of 5234 *15* from (^{3}He,α), 5249 *5* from (p,d) and 5257 *3* from (d,α),(pol d,α).
			Jπ: L(p,d)=L(^{3}He,α)=0+2 from 3/2+.
5286 *3*	(1+,2+,3+)	O Q	E(level): 5272 *22* from (p,^{3}He).
			Jπ: L(p,^{3}He)=2(+0) from 0+.
5296 *3*		f Q	
530×10[1] *10*	(6−)	G	Jπ: proposed in (p,n) based on σ(θ).
5307 *3*		f Q	

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Adopted Levels, Gammas (continued)

^{38}K Levels (continued)

E(level)†	Jπ	XREF	Comments
5333 *5*		f HI Q	XREF: H(5350). E(level): weighted average of 5330 *3* from (d,α),(pol d,α) and 5341 *5* from (p,d).
5407 *3*		Q	
5439 *3*	(1,2)$^+$	i L Q	E(level): others: 5440 *10* from (^{3}He,α), 5449 *4* from (p,d) could correspond to 5439 or 5459 in (d,α),(pol d,α). Jπ: L(^{3}He,α)=2(+0) from 3/2$^+$; L(p,d)=2+0 from 3/2$^+$ for 5439 or 5459.
5459 *3*	(1$^+$,2$^+$)	Hi Q	XREF: H(5468). Jπ: L(p,d)=2+0 from 3/2$^+$ for 5439 or 5459;
5480 *3*		Q	
5549 *6*	1$^+$,2$^+$	I	Jπ: L(p,d)=2+0 from 3/2$^+$.
5601 *3*		l Q	
5620 *4*	1$^+$,2$^+$	HI l Q	E(level): weighted average of 5626 *4* from (p,d), and 5617 *3* from (d,α),(pol d,α). Jπ: L(p,d)=0+2 from 3/2$^+$.
5677 *3*	(1$^-$,2$^-$,3$^-$)	I Q	E(level): weighted average of 5680 *5* from (p,d) and 5676 *3* from (d,α),(pol d,α). Jπ: L(p,d)=(1+3) from 3/2$^+$.
5693 *3*		Q	
5733 *4*	1$^+$,2$^+$	I Q	E(level): weighted average of 5737 *4* from (p,d) and 5730 *3* from (d,α),(pol d,α). Jπ: L(p,d)=2+0 from 3/2$^+$.
5749 *3*		l Q	
5771 *4*		I l Q	E(level): weighted average of 5778 *6* from (p,d), and 5769 *3* from (d,α),(pol d,α).
5795 *3*		l Q	
5810 *3*	1$^+$,2$^+$	I l Q	E(level): weighted average of 5809 *6* from (p,d) and 5810 *3* from (d,α),(pol d,α). Jπ: L(p,d)=0+2 from 3/2$^+$.
5828 *3*		l Q	
5852 *3*	1$^+$,2$^+$	HI l Q	XREF: H(5840). E(level): weighted average of 5856 *5* from (p,d), and 5851 *3* from (d,α),(pol d,α). Jπ: L(p,d)=2+0 from 3/2$^+$.
5869 *3*		l Q	
5891 *5*	1$^+$,2$^+$	I	Jπ: L(p,d)=2+0 from 3/2$^+$.
590×10[1] *10*	(6$^-$)	G	Jπ: proposed based on σ(θ) in (p,n).
5934 *3*		Q	
5944 *4*	(1 to 5)$^-$	I Q	Jπ: L(p,d)=3 from 3/2$^+$.
5972 *3*	1$^+$,2$^+$	I Q	E(level): weighted average of 5976 *5* from (p,d) and 5970 *3* from (d,α),(pol d,α). Jπ: L(p,d)=0+2 from 3/2$^+$.
5986 *4*	1$^+$,2$^+$	I Q	E(level): weighted average of 5991 *5* from (p,d) and 5983 *4* from (d,α),(pol d,α). Jπ: L(p,d)=2+0 from 3/2$^+$.
6002 *3*		h Q	
6022 *4*		h Q	
6230		H	
6380 *10*	(0 to 4)$^+$	H L Q	XREF: Q(6420). E(level): from (^{3}He,α). Jπ: L(^{3}He,α)=2(+0) from 3/2$^+$.
6590 *10*	(0 to 4)$^+$	L	Jπ: L(^{3}He,α)=2(+0) from 3/2$^+$.
6720 *50*	(1$^+$)	G Q	XREF: G(6700). E(level): from (d,α),(pol d,α). Jπ: from σ(θ) in (p,n); interpreted as GT transition.
7000 *50*		Q	

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Adopted Levels, Gammas (continued)

^{38}K Levels (continued)

E(level)[†]	J$^\pi$	XREF	Comments
7130 *20*	(0 to 4)$^+$	L	J$^\pi$: L(^{3}He,α)=2(+0) from 3/2$^+$.
7320 *50*	(1$^+$)	Q	J$^\pi$: L(d,α)=0+2 from 0$^+$.
7396.8 *6*	(10$^-$)#@	C	
7730		H	
8693.1 *6*	(12$^-$)#@	C	
8747.5 *7*	(11$^-$)#@	C	
970×10^1 *10*		G	
9880 *50*	(3$^+$)	Q	J$^\pi$: L(d,α)=2+4 from 0$^+$.
990×10^1 *10*	(1$^+$)	G	J$^\pi$: from $\sigma(\theta)$ in (p,n); interpreted as GT transition.
10260 *50*	(1$^+$)	G Q	XREF: G(10200). J$^\pi$: from $\sigma(\theta)$ in (p,n); interpreted as GT transition.
10980.6 *11*	(13$^-$)#@	C	

[†] From a least-squares fit to γ-ray energies with uncertainties for levels connected with those γ rays and from (d,α),(pol d,α) for others above 4410, unless otherwise noted.

[‡] From Doppler-shift attenuation method (DSAM) in (d,$\alpha\gamma$), unless otherwise stated.

[#] Based on comparison of states in ^{38}K with 0$^+$,g.s.; 2$^+$,1970; 3$^-$,4180; 5$^-$,5170; 4$^-$,5900 and 6$^-$,7350 levels in ^{36}Ar when (7)$^+$ at 3458 in ^{38}K is lined up with the 0$^+$, g.s. of ^{36}Ar.

[@] Based on J=7 for 3458 level, for less likely choice of J(3458)=5, spin would be 2 units less.

Adopted Levels, Gammas (continued)

$\gamma(^{38}K)$

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.	δ	α[†]	Comments
130.22	0^+	130.1 *2*	100	0	3^+	[M3]		0.395	α(K)=0.357 *6*; α(L)=0.0344 *6*; α(M)=0.00370 *6* α(N)=0.0001258 *20* B(M3)(W.u.)=0.21 *3* E_γ: from 2008Le12 in ^{38}K IT decay.
458.53	1^+	328.1 *2*	100.0 *3*	130.22	0^+	M1		6.07×10^{-4}	α(K)=0.000555 *8*; α(L)=4.69×10^{-5} *7*; α(M)=5.09×10^{-6} *8* α(N)=1.87×10^{-7} *3* B(M1)(W.u.)=0.088 *+9−8* E_γ: weighted average of 328.3 *3* from (^{16}O,pnγ), 328.5 *3* from (α,nγ), 327.4 *5* from (^{3}He,pγ), 332 *2* from (^{3}He,$\alpha\gamma$), and 327.9 *2* from (d,$\alpha\gamma$). I_γ: from (d,$\alpha\gamma$). Mult.: D from $\gamma(\theta)$ and polarity=M indicated by substate population data in (d,$\alpha\gamma$).
		458.6 *3*	1.01 *16*	0	3^+	[E2]		7.70×10^{-4}	α(K)=0.000704 *10*; α(L)=5.95×10^{-5} *9*; α(M)=6.44×10^{-6} *10* α(N)=2.35×10^{-7} *4* B(E2)(W.u.)=5.2 *+15−12* E_γ: weighted average of 458.7 *3* from (α,nγ) and 458.4 *4* from (d,$\alpha\gamma$). I_γ: weighted average of 0.96 *10* from (α,nγ), and 1.5 *3* from (d,$\alpha\gamma$).
1697.65	1^+	1239	0.26 *5*	458.53	1^+				I_γ: from ^{38}Ca ε decay.
		1567.4 *2*	100	130.22	0^+	M1		1.10×10^{-4}	α(K)=2.31×10^{-5} *4*; α(L)=1.94×10^{-6} *3*; α(M)=2.10×10^{-7} *3* α(N)=7.76×10^{-9} *11*; α(IPF)=8.50×10^{-5} *12* B(M1)(W.u.)=0.119 *+32−21* E_γ: weighted average of 1566.4 *6* from (^{3}He,pγ), 1567.7 *5* from ^{38}Ca ε decay, and 1567.4 *2* from (d,$\alpha\gamma$). Mult.: D from $\gamma(\theta)$ polarity=M indicated by substate population data in (d,$\alpha\gamma$).
		1698	0.08 *4*	0	3^+	[E2]		1.97×10^{-4}	α(K)=2.27×10^{-5} *4*; α(L)=1.91×10^{-6} *3*; α(M)=2.07×10^{-7} *3* α(N)=7.63×10^{-9} *11*; α(IPF)=0.0001720 *24* B(E2)(W.u.)=0.09 *+8−6* I_γ: from ^{38}Ca ε decay.
2401.12	2^+	1942.5 *1*	100 *2*	458.53	1^+	M1+E2	+0.077 *12*	2.42×10^{-4}	α(K)=1.603×10^{-5} *23*; α(L)=1.341×10^{-6} *19*; α(M)=1.456×10^{-7} *21* α(N)=5.38×10^{-9} *8*; α(IPF)=0.000225 *4* B(M1)(W.u.)=0.053 *+24−13*; B(E2)(W.u.)=0.28 *+26−13* E_γ: weighted average of 1942.6 *10* from (^{3}He,pγ), 1944 *2* from (^{3}He,$\alpha\gamma$), and 1942.5 *1* from (d,$\alpha\gamma$). I_γ: from (d,$\alpha\gamma$). Mult.,δ: from $\gamma(\theta)$ in (d,$\alpha\gamma$) and RUL.
		2270.5 *9*	8 *2*	130.22	0^+	[E2]		4.61×10^{-4}	α(K)=1.333×10^{-5} *19*; α(L)=1.116×10^{-6} *16*; α(M)=1.211×10^{-7} *17* α(N)=4.47×10^{-9} *7*; α(IPF)=0.000446 *7* B(E2)(W.u.)=1.8 *+14−8*

$^{38}_{19}K_{19}$-7

Adopted Levels, Gammas (continued)

$\gamma(^{38}K)$ (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.	δ	α[†]	Comments
									E_γ: weighted average of 2270.3 *15* from (^{3}He,pγ) and 2270.6 *9* from (d,$\alpha\gamma$).
2613.01	3$^-$	2613.0 *3*	100	0	3$^+$	[E1]		1.04×10^{-3}	I_γ: weighted average of 6.4 *21* from (^{3}He,pγ) and 9 *2* from (d,$\alpha\gamma$). α(K)=6.84×10^{-6} *10*; α(L)=5.72×10^{-7} *8*; α(M)=6.21×10^{-8} *9* α(N)=2.29×10^{-9} *4*; α(IPF)=0.001029 *15* B(E1)(W.u.)=6×10^{-6} *3*
2646.19	(4)$^-$	33.18 *3*	0.67 *4*	2613.01	3$^-$	M1(+E2)	<0.09	0.29 *8*	E_γ: weighted average of 2613.0 *3* from (^{16}O,pnγ) and 2612.9 *4* from (d,$\alpha\gamma$). α(K)=0.26 *7*; α(L)=0.024 *7*; α(M)=0.0026 *7* α(N)=8.6×10^{-5} *20* B(M1)(W.u.)>0.0040
		2187.6 *2*	1.51 *8*	458.53	1$^+$	[E3]		2.62×10^{-4}	E_γ,I_γ: from (^{16}O,pnγ). Mult.,δ: from α(exp) in (^{16}O,pnγ). α(K)=2.21×10^{-5} *3*; α(L)=1.85×10^{-6} *3*; α(M)=2.01×10^{-7} *3* α(N)=7.41×10^{-9} *11*; α(IPF)=0.000238 *4* B(E3)(W.u.)=0.89 *+17−14*
		2646.0 *3*	100.0 *12*	0	3$^+$	[E1]		1.06×10^{-3}	E_γ,I_γ: from (^{16}O,pnγ). α(K)=6.73×10^{-6} *10*; α(L)=5.63×10^{-7} *8*; α(M)=6.10×10^{-8} *9* α(N)=2.25×10^{-9} *4*; α(IPF)=0.001049 *15* B(E1)(W.u.)=3.2×10^{-8} *+4−3*
2827.4	1$^-$	425.3 *8*	10.5 *5*	2401.12	2$^+$	[E1]		2.52×10^{-4}	E_γ: weighted average of 2646.0 *2* from (^{16}O,pnγ), 2645 *1* from (π^-,2n),(π^-,2nγ), and 2646.3 *7* from (d,$\alpha\gamma$). I_γ: from (^{16}O,pnγ). α(K)=0.000230 *4*; α(L)=1.93×10^{-5} *3*; α(M)=2.09×10^{-6} *4* α(N)=7.68×10^{-8} *12* B(E1)(W.u.)=0.0034 *+14−8*
		2697.9 *7*	100 *1*	130.22	0$^+$	[E1]		1.09×10^{-3}	E_γ: weighted average of 424.4 *13* from (^{3}He,pγ) and 425.6 *8* from (d,$\alpha\gamma$). I_γ: from (d,$\alpha\gamma$). Other: 11 *3* from (^{3}He,pγ). α(K)=6.56×10^{-6} *10*; α(L)=5.48×10^{-7} *8*; α(M)=5.95×10^{-8} *9* α(N)=2.20×10^{-9} *3*; α(IPF)=0.001080 *16* B(E1)(W.u.)=0.000125 *+38−24*
2869.2	2$^-$	467.0 *10*	31.4 *10*	2401.12	2$^+$	[E1]		1.96×10^{-4}	E_γ: weighted average of 2696.5 *12* from (^{3}He,pγ) and 2698.3 *6* from (d,$\alpha\gamma$). I_γ: from (d,$\alpha\gamma$). α(K)=0.000179 *3*; α(L)=1.507×10^{-5} *23*; α(M)=1.633×10^{-6} *25* α(N)=5.99×10^{-8} *9* B(E1)(W.u.)=0.00029 *+13−7*
		1171.6 *7*	17 *2*	1697.65	1$^+$	[E1]		6.50×10^{-5} *10*	E_γ: weighted average of 465.3 *10* from (^{3}He,pγ) and 467.6 *6* from (d,$\alpha\gamma$). I_γ: weighted average of 58 *13* from (^{3}He,pγ) and 31.4 *5* from (d,$\alpha\gamma$). α=6.50×10^{-5} *10*; α(K)=2.35×10^{-5} *4*; α(L)=1.97×10^{-6} *3*;

$^{38}_{19}K_{19}$-8

Adopted Levels, Gammas (continued)

γ(^{38}K) (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.	α[†]	Comments
								α(M)=2.14×10^{-7} *3* α(N)=7.88×10^{-9} *11*; α(IPF)=3.93×10^{-5} *7* B(E1)(W.u.)=1.0×10^{-5} *+5−3* E_γ: weighted average of 1170.6 *13* from (^{3}He,pγ) and 1171.9 *7* from (d,αγ). I_γ: weighted average of 40 *11* from (^{3}He,pγ) and 17.0 *10* from (d,αγ).
2869.2	2$^-$	2411.2 *17*	57.8 *7*	458.53	1$^+$	[E1]	9.20×10^{-4}	α(K)=7.63×10^{-6} *11*; α(L)=6.38×10^{-7} *9*; α(M)=6.92×10^{-8} *10* α(N)=2.56×10^{-9} *4*; α(IPF)=0.000912 *13* B(E1)(W.u.)=3.9×10^{-6} *+16−9* E_γ: weighted average of 2410.8 *17* from (^{3}He,pγ) and 2411.6 *17* from (d,αγ). I_γ: weighted average of 66 *19* from (^{3}He,pγ) and 57.8 *7* from (d,αγ).
		2869.8 *9*	100 *1*	0	3$^+$	[E1]	1.18×10^{-3}	α(K)=6.05×10^{-6} *9*; α(L)=5.05×10^{-7} *7*; α(M)=5.48×10^{-8} *8* α(N)=2.02×10^{-9} *3*; α(IPF)=0.001176 *17* B(E1)(W.u.)=4.0×10^{-6} *+16−9* E_γ: weighted average of 2868.9 *15* from (^{3}He,pγ) and 2870.1 *9* from (d,αγ). I_γ: from (d,αγ).
2993.0	0$^-$	2534.4 *3*	100	458.53	1$^+$	[E1]	9.91×10^{-4}	α(K)=7.13×10^{-6} *10*; α(L)=5.96×10^{-7} *9*; α(M)=6.47×10^{-8} *9* α(N)=2.39×10^{-9} *4*; α(IPF)=0.000983 *14* B(E1)(W.u.)=0.00032 *+12−7* E_γ: from (d,αγ).
3315.4	(1$^+$,2$^-$,3$^+$)	914.1 *8*	100 *7*	2401.12	2$^+$			E_γ: weighted average of 913.8 *8* from (^{3}He,pγ) and 914.7 *12* from (d,αγ). I_γ: from (d,αγ).
		3315.5 *12*	76 *7*	0	3$^+$			E_γ: weighted average of 3316.3 *15* from (^{3}He,pγ) and 3314.9 *12* from (d,αγ). I_γ: weighted average of 70 *7* from (^{3}He,pγ) and 82 *7* from (d,αγ).
3341.1	1$^+$	1643	17 *11*	1697.65	1$^+$			I_γ: from ^{38}Ca ε decay.
		2883	4.2 *28*	458.53	1$^+$			I_γ: from ^{38}Ca ε decay.
		3210.7 *7*	100 *6*	130.22	0$^+$	[M1]	7.57×10^{-4}	α(K)=7.24×10^{-6} *11*; α(L)=6.05×10^{-7} *9*; α(M)=6.56×10^{-8} *10* α(N)=2.43×10^{-9} *4*; α(IPF)=0.000749 *11* B(M1)(W.u.)>0.014 E_γ: from (d,αγ). I_γ: from ^{38}Ca ε decay.
3420.07	(6)$^-$	773.9 *2*	100.0 *11*	2646.19	(4)$^-$	E2	1.55×10^{-4}	α(K)=0.0001415 *20*; α(L)=1.191×10^{-5} *17*; α(M)=1.291×10^{-6} *18* α(N)=4.73×10^{-8} *7* B(E2)(W.u.)=2.2 *+4−3* E_γ,I_γ: from (^{16}O,pnγ). Mult.: from γ(θ) and γ(lin pol) in ^{24}Mg(^{16}O,pnγ).
		3420.0 *3*	76.7 *11*	0	3$^+$	[E3]	7.03×10^{-4}	α(K)=9.43×10^{-6} *14*; α(L)=7.89×10^{-7} *11*; α(M)=8.56×10^{-8} *12* α(N)=3.16×10^{-9} *5*; α(IPF)=0.000693 *10* B(E3)(W.u.)=16.0 *+30−22* E_γ,I_γ: from (^{16}O,pnγ).

$^{38}_{19}K_{19}$-9

Adopted Levels, Gammas (continued)

$\gamma(^{38}K)$ (continued)

E_i(level)	J_i^π	E_γ ‡	I_γ #	E_f	J_f^π	Mult.	δ	α †	Comments
3429.7	2^+	1028.0 *12*	100 *5*	2401.12	2^+	[M1]		5.47×10^{-5} *8*	B(M1)(W.u.)>0.10 $\alpha=5.47\times10^{-5}$ *8*; α(K)=5.00×10^{-5} *7*; α(L)=4.20×10^{-6} *6*; α(M)=4.56×10^{-7} *7* α(N)=1.680×10^{-8} *24* E_γ: unweighted average of 1026.8 *7* from (^{3}He,pγ) and 1029.1 *7* from (d,$\alpha\gamma$). I_γ: from (^{3}He,pγ).
		3430.3 *15*	67 *5*	0	3^+				E_γ: weighted average of 3430.2 *15* from (^{3}He,pγ) and 3431 *4* from (d,$\alpha\gamma$). I_γ: from (^{3}He,pγ).
3458.10	$(7)^+$	38.03 *3*	100 *5*	3420.07	$(6)^-$	(E1)		0.402	α(K)=0.368 *6*; α(L)=0.0310 *5*; α(M)=0.00331 *5* α(N)=0.0001153 *17* B(E1)(W.u.)=2.84×10^{-7} *6* E_γ,I_γ: from (^{16}O,pnγ). Mult.,δ: from α(exp) in (^{16}O,pnγ) and (α,nγ); δ(M2/E1)=0.00 *13*. α(exp) also consistent with M1+E2 with δ=0.15 *2*.
		811.9 *2*	33.8 *5*	2646.19	$(4)^-$	[E3]		3.17×10^{-4}	α(K)=0.000290 *4*; α(L)=2.46×10^{-5} *4*; α(M)=2.66×10^{-6} *4* α(N)=9.70×10^{-8} *14* B(E3)(W.u.)=0.54 *+4−3* E_γ,I_γ: from (^{16}O,pnγ).
		3457.7 *4*	0.27 *3*	0	3^+	[E4]		1.364×10^{-5} *20*	$\alpha=1.364\times10^{-5}$ *20*; α(K)=1.248×10^{-5} *18*; α(L)=1.046×10^{-6} *15*; α(M)=1.135×10^{-7} *16* α(N)=4.19×10^{-9} *6* B(E4)(W.u.)=0.0040 *+7−6* E_γ,I_γ: from (^{16}O,pnγ).
3614.6	$(3,5)^-$	968.4 *4*		2646.19	$(4)^-$				E_γ: from (d,$\alpha\gamma$).
3668.1	3^+	1267.0 *4*	100	2401.12	2^+	M1(+E2)	+0.02 *4*	5.20×10^{-5} *8*	$\alpha=5.20\times10^{-5}$ *8*; α(K)=3.39×10^{-5} *5*; α(L)=2.84×10^{-6} *4*; α(M)=3.08×10^{-7} *5* α(N)=1.136×10^{-8} *16*; α(IPF)=1.494×10^{-5} *22* B(M1)(W.u.)=0.12 *+8−4* E_γ: from (d,$\alpha\gamma$). Mult.,δ: D+Q from $\gamma(\theta)$ in (d,$\alpha\gamma$); polarity is from no level-parity change determined from L-transfer data.
3687.6	(3)	1041.3 *17*	50 *10*	2646.19	$(4)^-$				E_γ: unweighted average of 1039.6 *7* from (^{3}He,pγ) and 1042.9 *3* from (d,$\alpha\gamma$). I_γ: from (^{3}He,pγ). Other: 217 *44* in (d,$\alpha\gamma$).
		1074.3 *10*	100 *10*	2613.01	3^-				E_γ: weighted average of 1073.3 *7* from (^{3}He,pγ) and 1075.3 *7* from (d,$\alpha\gamma$). I_γ: from (^{3}He,pγ). Other: 100 *33* in (d,$\alpha\gamma$).
		3557 @		130.22	0^+				E_γ: γ from (d,$\alpha\gamma$) only.
		3690 *3*	42 *12*	0	3^+				E_γ: from (^{3}He,pγ) only.

$^{38}_{19}K_{19}$-10

Adopted Levels, Gammas (continued)

$\gamma(^{38}K)$ (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.	α[†]	Comments
3703.7	$(1^+,2,3^+)$	1302.6 *3*		2401.12	2^+			E_γ: from (d,$\alpha\gamma$).
3738.8	$(1^+$ to $5^+)$	3739		0	3^+			
3813.6	2^-	1412.1 *7*	100 *12*	2401.12	2^+			E_γ: weighted average of 1412.3 *13* from (^{3}He,pγ) and 1412.1 *7* from (d,$\alpha\gamma$). I_γ: from (^{3}He,pγ).
		3815.2 *15*	96 *12*	0	3^+			E_γ,I_γ: from (^{3}He,pγ).
3841.0		1195		2646.19	$(4)^-$			
3855.8	1^+	3725.4 *19*	100	130.22	0^+	[M1]	9.46×10^{-4}	B(M1)(W.u.)>0.0051 α(K)=5.81×10^{-6} *9*; α(L)=4.86×10^{-7} *7*; α(M)=5.27×10^{-8} *8* α(N)=1.95×10^{-9} *3*; α(IPF)=0.000940 *14* E_γ: from (d,$\alpha\gamma$).
3931.0	2^-	1318.0 *5*		2613.01	3^-			E_γ: from (d,$\alpha\gamma$).
3976.3	1^+	3516.4 *14*	35 *10*	458.53	1^+			I_γ: from (^{3}He,pγ). Other: 7 *6* in ^{38}Ca ε decay.
		3848.0 *19*	100 *10*	130.22	0^+	[M1]	9.90×10^{-4}	B(M1)(W.u.)>0.0071 α(K)=5.55×10^{-6} *8*; α(L)=4.64×10^{-7} *7*; α(M)=5.03×10^{-8} *7* α(N)=1.86×10^{-9} *3*; α(IPF)=0.000984 *14* E_γ: weighted average of 3847.6 *19* from (^{3}He,pγ) and 3848.5 *21* from (d,$\alpha\gamma$). I_γ: from (^{3}He,pγ).
4174.9	$(1)^+$	3716	100	458.53	1^+			
4214.2	(1^-)	1809.6 *27*	39 *8*	2401.12	2^+			E_γ,I_γ: from (^{3}He,pγ).
		4085.9 *21*	100 *8*	130.22	0^+			E_γ,I_γ: from (^{3}He,pγ).
4318.2	$(1^+$ to $5^+)$	4318		0	3^+			
4333.4	$(0^-$ to $4^-)$	402		3931.0	2^-			
4394.7	$(1^+$ to $5^+)$	4394		0	3^+			
4409.6	$(0$ to $3^+)$	2712		1697.65	1^+			
4587.9		4588		0	3^+			
4700.9	$(1^+,2^+)$	1086.3 *7*		3614.6	$(3,5)^-$			E_γ: from (d,$\alpha\gamma$).
4723	$(0$ to $3^+)$	1382		3341.1	1^+			
4901.2	$(0^+$ to $4^+)$	2500		2401.12	2^+			
4989.9	$1^+,2^+$	2589		2401.12	2^+			
5047.8	$(1$ to $5)^-$	2435		2613.01	3^-			
5133.1	$(0^+$ to $4^+)$	2732		2401.12	2^+			
5216.4	$(0$ to $3^+)$	3519		1697.65	1^+			
5253.7	(9^+)	1795.6 *3*		3458.10	$(7)^+$			E_γ: from (^{16}O,pnγ).
7396.8	(10^-)	2143.0 *4*		5253.7	(9^+)			E_γ: from (^{16}O,pnγ).
8693.1	(12^-)	1296.3 *3*		7396.8	(10^-)			E_γ: from (^{16}O,pnγ).
8747.5	(11^-)	1350.7 *4*		7396.8	(10^-)			E_γ: from (^{16}O,pnγ).
10980.6	(13^-)	2287.4 *9*		8693.1	(12^-)			E_γ: from (^{16}O,pnγ).

[†] Additional information 4.
[‡] Values with uncertainties are from (d,$\alpha\gamma$), unless otherwise noted; those without uncertainties are from level-energy differences.

Adopted Levels, Gammas (continued)

$\gamma(^{38}K)$ (continued)

[#] From (d,$\alpha\gamma$) and/or (^{3}He,pγ), weighted averages are taken where available, unless otherwise noted.
[@] Placement of transition in the level scheme is uncertain.

$^{38}_{19}K_{19}$-12

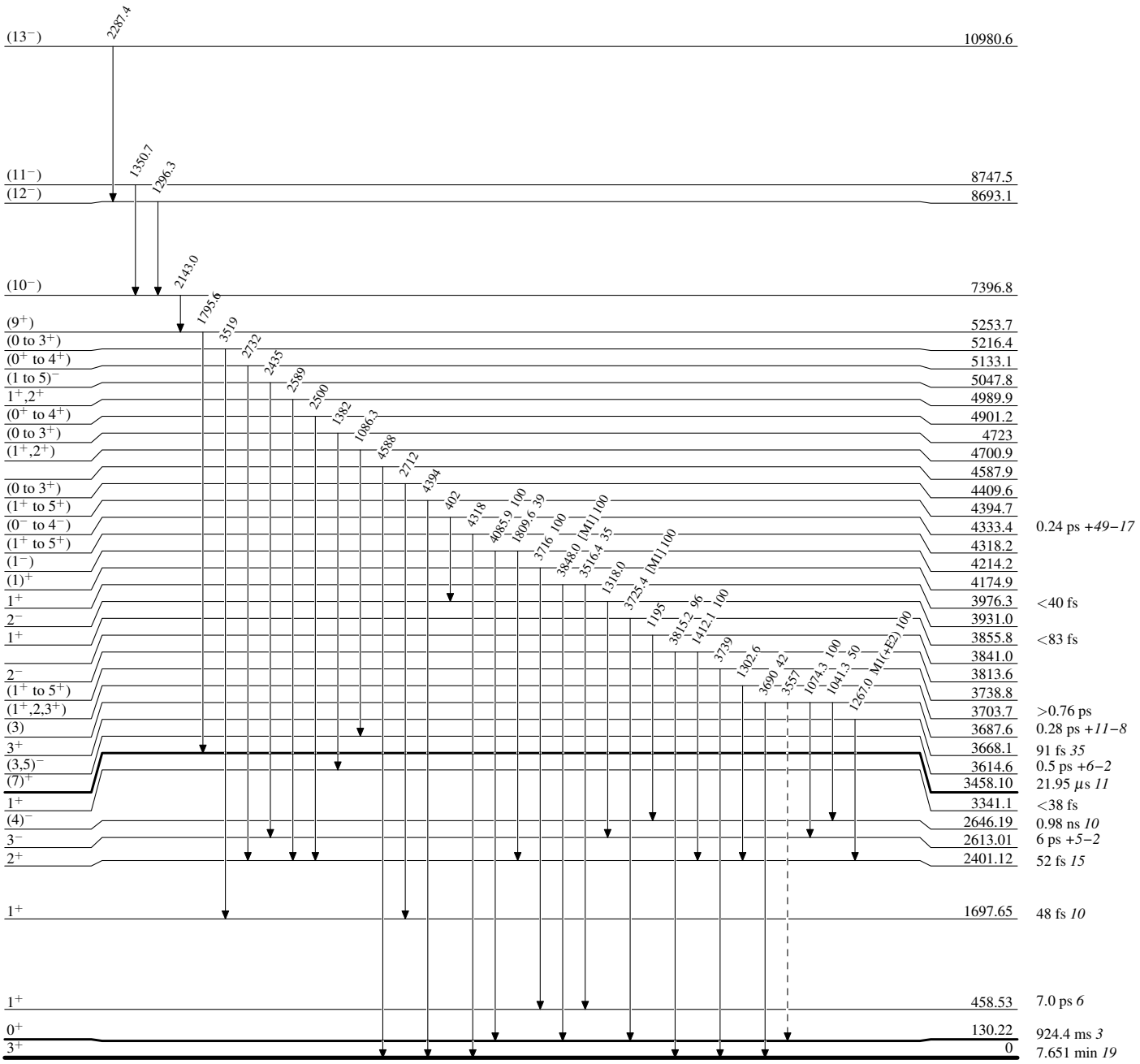
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

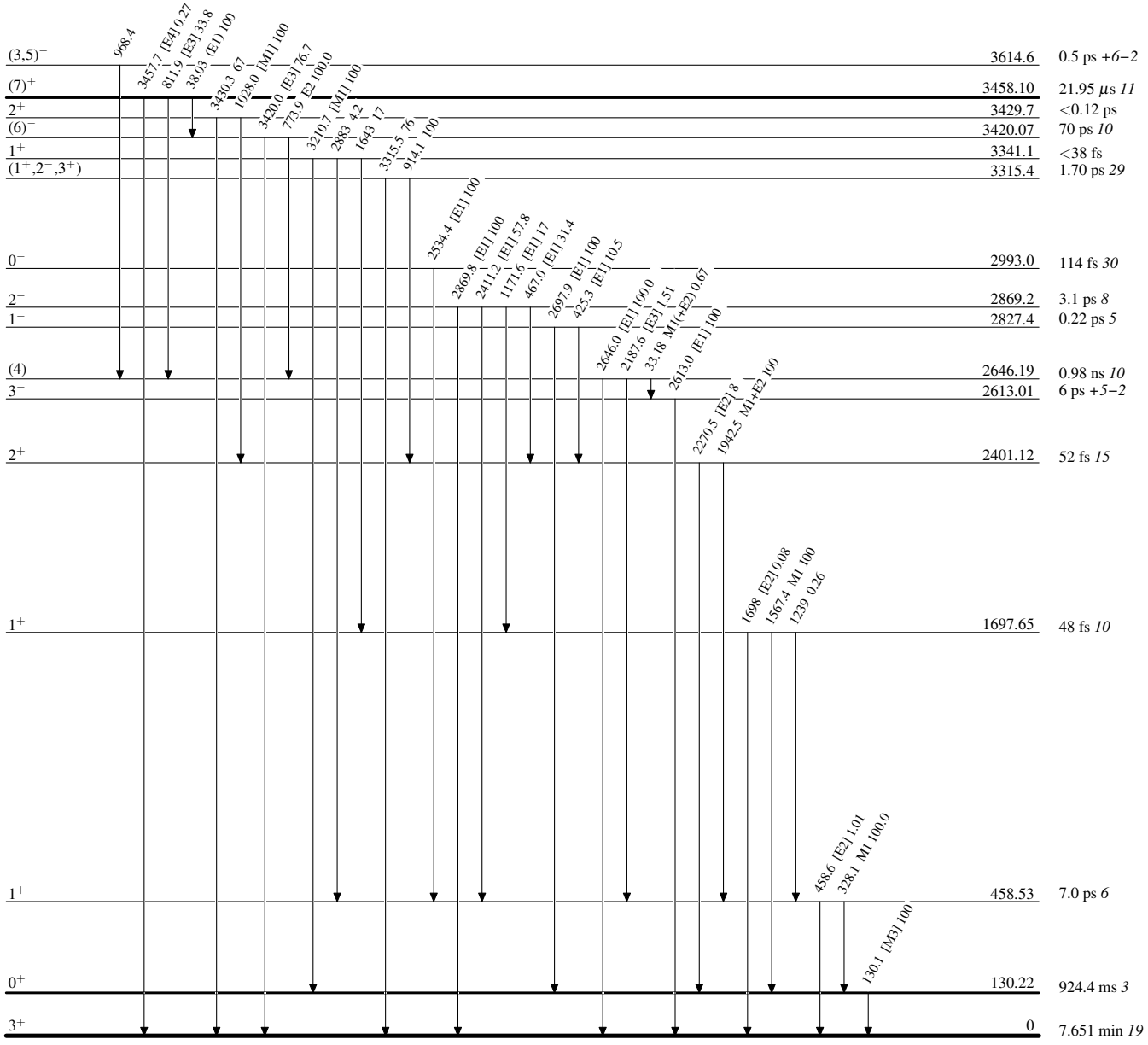


$^{38}_{19}K_{19}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{38}_{19}K_{19}$