Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 91,1 (2000)	15-Jul-2000

Q(β^-)=−7052.39 *10*; S(n)=13189.2 *9*; S(p)=10344.8 *7*; Q(α)=−8004.7 *4* 2012Wa38
Note: Current evaluation has used the following Q record $ −7051.4 *10* 13189.8 *8* 10345.0 *7* 1995Au04.
Data from (p,γ) are often inconsistent with data from other experiments. The evaluator has excluded part of the (p,γ) data from the Adopted Levels, gammas file.
Isotope shifts: 1996Lu12, 1996Fu23, 1995Ga44, 1992Az03.
Other reactions:
^{27}Al(^{19}F,γ): 1993Fe01.
^{46}Ti(t,t′): 1994So26.
^{46}Ti(^{58}Ni,^{58}Ni): 1997Ku25, 1994Ab33.

^{46}Ti Levels

Band(α,t) $K^\pi=0^+$ g.s. band. See (^{28}Si,2α2pγ), (^{9}Be,3nγ), (^{9}Be,2pnγ) or (^{12}C,α2pγ).
Band(O,S) $K^\pi=3^-$ band. See (^{28}Si,2α2pγ), (^{9}Be,3nγ), (^{9}Be,2pnγ) or (^{12}C,α2pγ).

Cross Reference (XREF) Flags

A	^{46}Sc β^- decay	L	^{44}Ca(^{16}O,^{14}C)	W	^{46}Ti(p,p′), (pol p,p′)
B	^{46}V β^+ decay	M	^{45}Sc(p,γ): primary γ′s	X	^{46}Ti(p,p′γ),(pol P,p′γ)
C	^{12}C(^{40}Ca,α2pγ)	N	^{45}Sc(p,γ): secondary γ′s	Y	^{46}Ti(d,d′)
D	^{28}Si(^{28}Si,2α2pγ)	O	^{45}Sc(^{3}He,d)	Z	^{46}Ti(^{3}He,^{3}He′)
E	^{32}S(^{16}O,2pγ)	P	^{45}Sc(α,t)	Others:	
F	^{39}K(^{12}C,αpγ)	Q	^{45}Sc(^{16}O,^{15}N)	AA	^{46}Ti(α,α′),(α,α′γ)
G	^{40}Ar(^{9}Be,3nγ)	R	^{46}Ti(γ,γ′)	AB	Coulomb excitation
H	^{40}Ca(^{9}Be,2pnγ)	S	^{46}Ti(e,e′p)	AC	^{47}Ti(p,d)
I	^{42}Ca(^{6}Li,d)	T	^{46}Ti(e,e′)	AD	^{47}Ti(d,t)
J	^{43}Ca(α,nγ)	U	^{46}Ti(n,n′)	AE	^{47}Ti(^{3}He,α)
K	^{44}Ca(^{3}He,n)	V	^{46}Ti(n,n′γ)	AF	^{48}Ti(p,t)

E(level)	J^π	$T_{1/2}$	XREF	Comments
0.0	0^+	stable	ABCDEFGHIJKLMNOPQR TUVWXYZ	XREF: Others: AA, AB, AC, AD, AE, AF
889.286 *3*	$2^{+\#}$	5.32 ps *15*	ABCDEFGHIJKLMNOPQR TUVWXYZ	XREF: Others: AA, AB, AC, AD, AE, AF μ=+0.98 *24* (1981Sh19,1989Ra17) Q=−0.21 *6* (1989Ra17) J^π: E2 γ to 0^+. $T_{1/2}$: weighted average of 4.69 ps *34* (^{46}Sc β^- decay), 4.5 ps *5* (^{16}O,2pγ), 5.6 ps *2* (Coulomb excitation, B(E2)=0.090 *4*), 7.5 ps *14* (γ,γ′) and 1.4 ps *+35−7* (p,γ) (1987Mo17).
2009.846 *5*	$4^{+\#}$	1.62 ps *10*	A CDEFGHIJ LMNOPQ T VWXYZ	XREF: Others: AA, AB, AC, AD, AE, AF J^π: L=4 in (p,p′) and (p,t). $T_{1/2}$: weighted average of 1.6 ps *1* (coulomb excitation), 1.8 ps *2* (^{16}O,2pγ), 1.5 ps *3* (^{9}Be,3nγ), 1.3 ps *6* (α,nγ) and 1.5 ps *3* (p,γ); other: 3.2 ps *+12−6* (α,α′γ).
2611.0 *2*	0^+	76[&] fs *21*	B J VWXYZ	XREF: Others: AF E(level): from (p,p′γ). J^π: L=0 in (p,t).
2961.8 *2*	$2^{+@}$	166 fs *7*	J MNOP T VWXY	J^π: L=2 in (p,p′). $T_{1/2}$: from (p,γ). Others: 150 fs *40* (α,nγ) and 49 fs *8*

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
				(p,p′γ).
3058.46 *12*	3⁻	7[&] ps *2*	CDEFGH J MNO VWXY	XREF: Others: AA J^π: L=3 in (p,p′) and (p,t). $T_{1/2}$: from (α,nγ); other: 2 ps *+2−1* (p,γ).
3168.00 *10*	1⁻[@]	176 fs *24*	C J MN R VWX	J^π: from L=1 in (p,p′). $T_{1/2}$: weighted average of 150 fs *40* (α,nγ) and 191 fs *30* (p,γ); 28 fs *8* from (γ,γ′) and 49 fs *9* from (p,p′γ) not used.
3213			J	
3217.3			V	E(level): from (n,n′γ).
3235.7 *2*	2⁺[@]	29 fs *6*	J MNO Q T VWXY	XREF: Others: AA, AC, AE, AF J^π: L=2 in (p,p′) and (p,t). However, L=5 in (α,α′). $T_{1/2}$: weighted average of 28 fs *10* (α,nγ) and 29 fs *+7−3* (p,γ); 13 fs *2* from (p,p′γ) not used.
3298.86 *16*	6⁺[#]	0.99 ps *9*	CDEFGH J MNOPQ VW	XREF: Others: AD, AE, AF J^π: L=6 in (p,p′). $T_{1/2}$: weighted average of 1.0 ps *5* (^{16}O,2pγ), 1.0 ps *2* (^{9}Be,3nγ), 1.1 ps *3* (α,nγ), and 0.97 ps *11* (p,γ).
3338 *18*			W	E(level): from (p,p′).
3441.39 *17*	4⁻[#]	66 ps *4*	CDE GH J MNO VWX	J^π: γ from 6⁻, γ to 3⁻ is ΔJ=1, D. $T_{1/2}$: weighted average of 58 ps *7* (^{16}O,2pγ) and 68 ps *4* (^{9}Be,2pnγ); 10 ps *+7−4* from (α,nγ) not used.
3553.1			V	E(level): from (n,n′γ).
3569.3 *3*	3⁻[‡]	50 fs *+19−16*	C MN VWX	XREF: Others: AA, AC, AF J^π: L=3 in (p,p′). $T_{1/2}$: from (p,p′γ); 211 fs *24* from (p,γ) was not used.
3571.7 *2*	0⁺[‡]	192 fs *+16−13*	J MNOP V XY	XREF: Others: AF J^π: L=0 in (p,t). $T_{1/2}$: weighted average of 180 fs *40* (α,nγ) and 194 fs *+17−14* (p,γ).
3579.8		70 fs *30*	J MN V	XREF: Others: AE E(level): from (n,n′γ). E(level)=3582 from (α,nγ); 3583 *3* from weighted average of values from (p,γ) and (^{3}He,α).
3610.2			J VW	E(level): from (n,n′γ). E(level)=3608 from (α,nγ).
3677	2⁻		T W	Observed in (e,e′) and (p,p′). J^π: from σ(θ) in (e,e′).
3696	2⁺		T	J^π: from σ(θ) in (e,e′).
3723.8 *4*	(2)⁺[‡]	57 fs *4*	C J MNO VWX	XREF: Others: AF J^π: L=1 in (^{3}He,d); L=(2) in (p,t). However, L=(4) in (p,p′). $T_{1/2}$: weighted average of 59 fs *4* (p,γ), 52 fs *14* (α,nγ); 33 fs *+16−11* from (p,p′γ) not included.
3731	1⁺		T	J^π: from σ(θ) in (e,e′).
3737.9 *3*	(1,2⁺)		X	E(level): from (p,p′γ). J^π: γ to 0⁺.
3771.5	⁺		V	XREF: Others: AC E(level): from (n,n′γ). E(level)=3780 *15* from (p,d). J^π: L=1+3 in (p,d).
3826.43 *18*	5⁻	3.7[&] ps *21*	C H J MN V	XREF: Others: AA J^π: γ(θ) in (^{12}C,α2pγ); γ to 3⁻, 6⁺.
3845.0 *5*	2⁺[‡]	8.9 fs *21*	J MNO V X	XREF: Others: AE, AF J^π: L=2 in (p,t).

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
				$T_{1/2}$: weighted average of 10 fs *4* (p,γ) and 8.5 fs *25* (p,p′γ); other: <0.024 ps from (α,nγ).
3848 *5*	(4$^+$)		W	J^π: L=(4) in (p,p′).
3852.44 *16*	5$^-$[#]	4.8 ps *8*	CD GH J V	J^π: γ to 3$^-$, 6$^+$; $\gamma(\theta)$ in (^{12}C,α2pγ). $T_{1/2}$: weighted average of 3.8 ps *17* (^{9}Be,3nγ), 4.9 ps *10* (^{9}Be,2pnγ), and 12 ps *5* (α,nγ).
3856 *4*			MN Q	XREF: Others: AC
3872	1$^+$		T	J^π: from $\sigma(\theta)$ in (e,e′).
3889.3 *14*	2$^+$	0.38[&] ps *7*	JKL VWX	J^π: L=2 in (p,p′).
3905.6 *3*	(1,2$^+$)	22 fs *4*	J MN V X	J^π: γ to 0$^+$. $T_{1/2}$: from (p,p′γ); other: 38 ps *+14−9* (p,γ).
3926 *8*	(2$^+$)[‡]		OP	XREF: Others: AE, AF E(level): weighted average of values from (α,t), (^{3}He,α), and (p,t). J^π: L=(2)in (p,t).
3941.9	4$^+$	<0.02 ps	J MN Q VW	XREF: Others: AC, AD, AE E(level): from (n,n′γ). E(level)=3941 from (α,nγ); 3941 *3* from weighted average of values from (p,γ), (p,p′), (p,d) and (^{3}He,α). J^π: L=4 in (p,p′).
4003.1			J VW	XREF: Others: AC E(level): from (n,n′γ). E(level)=4003 from (α,nγ).
4025.3	2$^+$		O T VWX	XREF: Others: AE E(level): from (n,n′γ). E(level)=4029 *5* from weighted average of values from (p,p′) and (^{3}He,α). J^π: from $\sigma(\theta)$ in (e,e′); γ′s to 4$^+$ and 0$^+$ levels.
4038.8			J MN V	E(level): from (n,n′γ). E(level)=4040 from (α,nγ); 4040 *4* from (p,γ).
4130.1	2$^+$[‡]		MNOP VW	XREF: Others: AA, AF E(level): from (n,n′γ). E(level)=4140 *4* from weighted average of values from (p,γ), (α,t), (p,p′) and (p,t). J^π: L=2 in (p,p′). However, L=3 in (α,α′).
4178.7	3$^-$[‡]		J V	XREF: Others: AF J^π: L=3 in (p,t).
4191.5	3$^-$		J MNO VW	J^π: L=3 in (p,p′).
4315.8 *10*	1$^+$	2.7 fs *4*	B R T VWX	XREF: Others: AC, AE J^π: from (γ,γ′) and $\sigma(\theta)$ in (e,e′). $\Gamma(0)^2/\Gamma$=0.172 eV *26* (1976Ra03). $T_{1/2}$: from $\Gamma(0)^2/\Gamma$ in (γ,γ′) and $\Gamma(0)/\Gamma$=1.
4322.6 *13*			C V	
4372.0	3$^-$		J VW	XREF: Others: AE J^π: L=3 in (p,p′).
4398 *8*	(5$^-$,6$^+$)[‡]		O	XREF: Others: AD, AF J^π: L=5,6 in (p,t).
4417.1 *5*	6$^-$	0.45[&] ps *17*	C H J MN VW	J^π: from $\gamma(\theta)$ in (^{12}C,α2pγ). However, L=(5) in (p,p′).
4437 *15*				XREF: Others: AE E(level): from (^{3}He,α).
4500 *10*				XREF: Others: AF E(level): from (p,t).
4523.4 *10*	4$^+$	0.07[&] ps *3*	C G J MN V	J^π: γ′s to 6$^+$,2$^+$ levels.

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
4527 *5*	(6^+)		MNOPQ W	XREF: Others: AE J^π: L=(6) in (p,p′).
4573 *20*				XREF: Others: AE E(level): from (^{3}He,α).
4617			O	
4662.30 *18*	$6^{-\#}$	1.4 ps *4*	CD GH J V	J^π: γ to 4^- is $\Delta J=2$, E2; γ to 5^- is $\Delta J=1$, D. $T_{1/2}$: from (^{9}Be,3nγ).
4675 *10*	$0^{+\ddagger}$			XREF: Others: AF J^π: L=0 in (p,t).
4697	(2^+)		J MN W	XREF: Others: AE J^π: L=(2) in (p,p′).
4726.4 *10*	$(5^-,6^+)$		C J OP	XREF: Others: AA J^π: from $\gamma(\theta)$ in (^{12}C,α2pγ).
4791 *4*	$(3^-)^\ddagger$		W	XREF: Others: AE, AF E(level): weighted average of values from (p,p′), (3He,a) and (p,t). J^π: L=(3) in (p,t).
4827.2 *22*	3^-		MN W	J^π: L=3 in (p,p′).
4845	$^+$		O	J^π: L=1+3 in (^{3}He,d).
4896.9 *3*	$8^{+\#}$	0.49 ps *6*	CD FGH J W	J^π: γ to 6^+ is $\Delta J=2$, Q; RUL. $T_{1/2}$: weighted average of 0.45 ps *9* (^{9}Be,3nγ), 0.6 ps *2* (^{9}Be,2pnγ), 0.39 ps *12* (α,nγ) and 0.92 ps *23* (^{28}Si,2α2pγ).
4950 *10*	$2^{+\ddagger}$		O	XREF: Others: AF E(level): from (p,t). J^π: L=2 in (p,t).
5000 *10*				XREF: Others: AF E(level): from (p,t).
5023.7 *12*	3^-		C G J MNO W	XREF: Others: AA, AE J^π: L=3 in (p,p′); L=0 in (^{3}He,d). However, L=4 in (α,α′).
5079 *4*	(4^+)		MN W	J^π: L=(4) in (p,p′).
5094	$^+$		O	J^π: L=1 in (^{3}He,d).
5117 *20*				XREF: Others: AE E(level): from (^{3}He,α).
5154 *10*			W	E(level): from (p,p′).
5180	$^+$		MNO Q	J^π: L=3 in (^{16}O,^{15}N).
5197.60 *18*	$7^{-\#}$	0.83 ps *3*	CD GH J	J^π: γ to 5^- is $\Delta J=2$, Q; RUL. $T_{1/2}$: from (α,nγ). Other: 0.6 ps *2* (^{9}Be,3nγ).
5206 *9*	3^-		W	XREF: Others: AE, AF E(level): weighted average of values from (p,p′) (^{3}He,α) and (p,t). J^π: L=3 in (p,p′); L=(4) in (p,t).
5230 *10*	2^+		T W	E(level): from (p,p′). J^π: from $\sigma(\theta)$ in (e,e′).
5280	6^+		J	XREF: Others: AA J^π: L=6 from (α,α′).
5321	2^+		O T	XREF: Others: AE E(level): from (e,e′). J^π: from $\sigma(\theta)$ in (e,e′).
5361 *9*	$(5^-,6^+)$		P W	J^π: L=(5,6) in (p,p′).
5363	2^+		O T	E(level): from (e,e′). J^π: from $\sigma(\theta)$ in (e,e′).
5409 *10*	3^-		W	J^π: L=3 in (p,p′).

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
5515 *10*	2^+		W	J^π: L=2 in (p,p′).
5530 *4*	3^-		MNOP	XREF: Others: AE, AF J^π: L=3 in (p,t).
5604 *10*	(2^+)		W	J^π: L=(2) in (p,p′).
5610 *30*	0^+		K O	J^π: L=0 in (^{3}He,n).
5700 *9*	(2^+)		W	XREF: Others: AE J^π: L=(2) in (p,p′).
5794 *4*	4^+		MN W	J^π: L=4 in (p,p′).
5811	$^+$		O	J^π: L=0 in (^{3}He,d).
5828 *10*	3^-		W	J^π: L=3 in (p,p′).
5840	$^+$			XREF: Others: AD J^π: L=3 in (d,t).
5872 *10*	(2^+)		W	XREF: Others: AA J^π: L=(2) in (p,p′).
5903 *20*	$^+$		O	XREF: Others: AE E(level): from (^{3}He,α). J^π: L=1+3 in (^{3}He,d).
5950 *4*	3^-		MN W	J^π: L=3 in (p,p′).
5965 *26*	$(6^+)^{\ddagger}$		OP	XREF: Others: AF J^π: L=(6) in (p,t).
5992 *10*	(4^+)		W	J^π: L=(4) in (p,p′).
6021	$^+$		O	J^π: L=1 in (^{3}He,d).
6025			J	
6094	3^-,4^-		O	J^π: L=0 in (^{3}He,d).
6118 *10*	2^+		W	XREF: Others: AF E(level): from (p,p′). J^π: L=2 in (p,p′).
6134	2^+		O T	J^π: from $\sigma(\theta)$ in (e,e′).
6150.5 *4*	$8^{-\#}$	0.31 ps *3*	CD GH J	J^π: γ to 6^- is ΔJ=2, Q; RUL. $T_{1/2}$: weighted average of 0.46 ps *12* (^{9}Be,3nγ) and 0.30 ps *3* (^{28}Si,2α2pγ).
6200.4 *9*	8^+	<0.19 ps	CD G J	J^π: from (^{28}Si,2α2pγ); however, J=(7) from (^{12}C,α2pγ). $T_{1/2}$: from (^{28}Si,2α2pγ).
6217 *10*	3^-		O W	J^π: L=3 in (p,p′).
6241.9 *3*	$10^{+\#}$	0.84 ps *4*	CD FGH J	J^π: γ to 8^+ is ΔJ=2, E2; no γ to J<8. $T_{1/2}$: weighted averaged of 0.83 ps *4* (α,nγ), 1.0 ps *3* (^{9}Be,3nγ), 0.9 ps *2* (^{9}Be,2pnγ) and 1.7 ps *4* (^{28}Si,2α2pγ).
6251			O	
6266 *6*			MN W	
6305 *20*				XREF: Others: AE E(level): from (^{3}He,α).
6338 *10*	4^+		O W	J^π: L=4 in (p,p′).
6360	1^+		W	J^π: L=0 in (p,p′).
6395 *6*	4^+		K MN W	XREF: Others: AA E(level): weighted average of values from (^{3}He,n), (p,γ) and (p,p′). J^π: L=4 in (p,p′).
6398	1^+		T	J^π: from $\sigma(\theta)$ in (e,e′).
6424	$^+$		O	J^π: L=1 in (^{3}He,d).
6458 *10*	3^-		W	J^π: L=3 in (p,p′).
6513 *10*			W	E(level): from (p,p′).
6550	$^+$		O	J^π: L=1 in (^{3}He,d).

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
6574 *10*			W	E(level): from (p,p′).
6616	$^+$		O	J^π: L=1 in (^{3}He,d).
6685 *10*	4^+		W	J^π: L=4 in (p,p′).
6739 *10*	$(4)^+$		O W	J^π: L=(4) in (p,p′); L=1+3 in (^{3}He,d).
6794 *10*			W	E(level): from (p,p′).
6830.3 *5*	9^-#	0.52 ps *6*	CD GH	J^π: γ to 7^- is ΔJ=2, Q; γ to 8^+ is ΔJ=1, D; RUL. $T_{1/2}$: weighted average of 0.52 ps *8* from (^{9}Be,3nγ) and 0.53 ps *10* (^{28}Si,2α2pγ).
6851	$^+$		O W	J^π: L=1+3 in (^{3}He,d).
6890 *10*	4^+		O W	XREF: Others: AF J^π: L=(3,4) in (p,p′); L=1 in (^{3}He,d).
6958 *10*	(3^-)		W	J^π: L=(3) in (p,p′).
6974	$^+$		O	J^π: L=1+3 in (^{3}He,d).
7019 *10*	$(3^-,4^+)$		W	J^π: L=(3,4) in (p,p′).
7041	$^+$		O	J^π: L=1+3 in (^{3}He,d).
7101	$^+$		O	J^π: L=1 in (^{3}He,d).
7120 *10*	(3^-)		W	J^π: L=(3) in (p,p′).
7147	$^+$		O	XREF: Others: AF E(level): from (^{3}He,d). J^π: L=1 in (^{3}He,d).
7172 *10*			W	E(level): from (p,p′).
7180	1^+		W	J^π: L=0 in (p,p′).
7201	$^+$		O	J^π: L=1 in (^{3}He,d).
7238 *10*			W	E(level): from (p,p′).
7288	$^+$		O	J^π: L=1+3 in (^{3}He,d).
7312 *10*	3^-		W	J^π: L=3 in (p,p′).
7350 *30*	$^+$		K O	E(level): from (^{3}He,n). J^π: L=1 in (^{3}He,d).
7392 *10*	(3^-)		W	J^π: L=(3) in (p,p′).
7410	1^+		W	J^π: L=0 in (p,p′).
7429	$^+$		O	J^π: L=1 in (^{3}He,d).
7472 *10*			W	E(level): from (p,p′).
7534 *10*	(3^-)		W	XREF: Others: AF J^π: L=(3) in (p,p′).
7558	$^+$		O	J^π: L=1 in (^{3}He,d).
7584	$^+$		O	J^π: L=1 in (^{3}He,d).
7608 *10*	$^+$		O W	E(level): from (p,p′). J^π: L=1 in (^{3}He,d).
7630	1^+		W	J^π: L=0 in (p,p′).
7660 *10*			W	E(level): from (p,p′).
7710 *10*	$^+$		O W	E(level): from (p,p′). J^π: L=1 in (^{3}He,d).
7730	1^+		W	J^π: L=0 in (p,p′).
7735 *10*			W	E(level): from (p,p′).
7788 *10*	$^+$		O W	E(level): from (p,p′). J^π: L=1 in (^{3}He,d).
7849	$^+$		O	J^π: L=1 in (^{3}He,d).
7874 *10*			W	E(level): from (p,p′).
7917	$^+$		O	J^π: L=1 in (^{3}He,d).
7937 *10*			W	E(level): from (p,p′).
7941.8 *4*	11^+#	0.31 ps *8*	CD GH	J^π: γ to 10^+ is ΔJ=1, M1; no γ to J<10. $T_{1/2}$: from (^{9}Be,3nγ); <0.07 ps from (^{9}Be,2pnγ) and <0.07 ps from (^{28}Si,2α2pγ).

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
7960.8 *8*	$10^{-\#}$	<0.30 ps	CD H	J^π: γ to 8^- is $\Delta J=2$, Q; no γ to J<8. $T_{1/2}$: from (^{28}Si,2α2pγ).
7979	+		O	J^π: L=1 in (^{3}He,d).
8013 *10*			W	E(level): from (p,p′).
8020 *30*	(0^+)		K	J^π: L=(0) in (^{3}He,n).
8040 *10*			O W	E(level): from (p,p′).
8088	+		O	J^π: L=1 in (^{3}He,d).
8134 *10*			W	E(level): from (p,p′).
8182	+		O	J^π: L=1 in (^{3}He,d).
8217.5 *3*	$12^{+\#}$	0.51 ps *5*	CD GH	J^π: γ to 11^+ is $\Delta J=1$, M1; γ to 10^+ is $\Delta J=2$, E2. $T_{1/2}$: weighted average of 0.57 ps *6* (^{9}Be,3nγ), 0.35 ps *9* (^{9}Be,2pnγ) and 0.58 ps *6* (^{28}Si,2α2pγ).
8230 *10*	+		O W	E(level): from (p,p′). J^π: L=1 in (^{3}He,d).
8283.9 *13*	$10,11,12^+$	<0.17 ps	CD	J^π: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ). $T_{1/2}$: from (^{28}Si,2α2pγ).
8293	+		O	J^π: L=1 in (^{3}He,d).
8346	+		O	J^π: L=1 in (^{3}He,d).
8384	+		O	J^π: L=1+3 in (^{3}He,d).
8460	1^+		W	J^π: L=0 in (p,p′).
8467	+		O	J^π: L=1+3 in (^{3}He,d).
8530	+		O	J^π: L=1 in (^{3}He,d).
8574	+		O	J^π: L=1+3 in (^{3}He,d).
8621	+		O	J^π: L=1 in (^{3}He,d).
8662	+		O	J^π: L=1 in (^{3}He,d).
8701	+		O	J^π: L=1 in (^{3}He,d).
8716.2 *12*	$11^{-\#}$	<0.29 ps	CD	J^π: γ only to 9^-. $T_{1/2}$: from (^{28}Si,2α2pγ).
8761	+		O	J^π: L=1 in (^{3}He,d).
8808	+		O	J^π: L=1 in (^{3}He,d).
8860	+		O	J^π: L=1 in (^{3}He,d).
8940	+		O	J^π: L=1 in (^{3}He,d).
8984	+		O	J^π: L=1 in (^{3}He,d).
9000	1^+		W	J^π: L=0 in (p,p′).
9070	+		O	J^π: L=1 in (^{3}He,d).
9111	+		O	J^π: L=1+3 in (^{3}He,d).
9141			O	
9168 *7*	$4^{+\ddagger}$		O	XREF: Others: AF E(level): from (p,t). J^π: L=4 in (p,t).
9170	1^+		W	J^π: L=0 in (p,p′).
9205 *9*	$6^{+\ddagger}$		O	XREF: Others: AE, AF J^π: L=6 in (p,t).
9253	+		O	J^π: L=1 in (^{3}He,d).
9304	+		O	J^π: L=1 in (^{3}He,d).
9345	+		O	J^π: L=1 in (^{3}He,d).
9399 *30*	+		O	XREF: Others: AE E(level): from (^{3}He,α). J^π: L=1 in (^{3}He,d).
9420	1^+		W	J^π: L=0 in (p,p′).
9426	+		O	J^π: L=3 in (^{3}He,d).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
9474	$^+$		O	XREF: Others: AE E(level): from (^{3}He,d). J^π: L=1 in (^{3}He,d).
9519	$^-$		O	J^π: L=2 in (^{3}He,d).
9550	1^+		W	J^π: L=0 in (p,p′).
9572	$^+$		O	J^π: L=3 in (^{3}He,d).
9615 *6*	2^+‡		O	XREF: Others: AF J^π: L=2 in (p,t).
9649	$^+$		O	J^π: L=1 in (^{3}He,d).
9670	1^+		W	J^π: L=0 in (p,p′).
9682			O	
9718	$^-$		O	J^π: L=2 in (^{3}He,d).
9761			O	
9770	1^+		W	J^π: L=0 in (p,p′).
9790			O	
9852† *19*			O	XREF: Others: AE
9864			O	
9870	1^+		W	J^π: L=0 in (p,p′).
9973† *19*	$^+$		O	XREF: Others: AE J^π: L=3 in (^{3}He,d).
10000	1^+		W	J^π: L=0 in (p,p′).
10038† *19*			O	XREF: Others: AE
10041.6 *8*	12^+,14^+#	0.6 ps *2*	CD GH	$T_{1/2}$: from (^{9}Be,3nγ); <0.6 ps from (^{28}Si, 2α2pγ). J^π: γ to 11^+ is ΔJ=1; γ to 12^+ is ΔJ=0, D+Q.
10180	1^+		W	J^π: L=0 in (p,p′).
10212 *25*			O	
10256 *25*			O	
10321 *25*			O	
10347 *30*				XREF: Others: AE Observed in (^{3}He,α).
10350	1^+		W	J^π: L=0 in (p,p′).
10374 *25*			O	
10380 *3*			D	
10441 *25*			O	
10523† *19*	$^+$		O	XREF: Others: AE J^π: L=3 in (^{3}He,d).
10602 *25*			O	
10661† *19*			O	XREF: Others: AE
10730 *25*			O	
10782 *25*	$^+$		O	J^π: L=3 in (p,p′).
10866 *22*			O	XREF: Others: AF E(level): weighted average of values from (^{3}He,d) and (p,t).
10938 *19*	$^+$		O	XREF: Others: AE E(level): weighted average of values from (^{3}He,d) and (^{3}He,α). J^π: L=1 in (^{3}He,d).
10980 *25*			O	
11050	1^+		W	J^π: L=0 in (p,p′).
11051 *25*			O	
11110 *25*			O	
11167 *25*			O	
11299 *25*			O	

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Adopted Levels, Gammas (continued)

^{46}Ti Levels (continued)

E(level)	J^π	XREF	Comments
11354 *3*	3	M	J^π: from $\gamma(\theta)$ in (p,γ).
11374.2 *23*		M	
11426 *19*		K O	E(level): weighted average of values from (^{3}He,n) and (^{3}He,d).
11450	1^+	W	J^π: L=0 in (p,p′).
11570	1^+	W	J^π: L=0 in (p,p′).
11698 *3*	(2,3)	M	J^π: from $\gamma(\theta)$ in (p,γ).
11840	1^+	W	J^π: L=0 in (p,p′).
12200	1^+	W	J^π: L=0 in (p,p′).
12460 *30*	0^+	K	J^π: L=0 in (^{3}He,n).
12650	1^+	W	J^π: L=0 in (p,p′).
12974 *4*		D	
13070	1^+	W	J^π: L=0 in (p,p′).
13169 *4*		D	
13310	1^+	W	J^π: L=0 in (p,p′).
14153 *6*	0^+		XREF: Others: AF J^π: from L=0 in (p,t).
14300 *60*	(0^+)	K	J^π: from L=(0) in (^{3}He,n).

† Weighted average of values from (^{3}He,d) and (^{3}He,α).
‡ From L(p,t).
# Based on analysis of $\gamma(\theta)$ from (^{28}Si,2α2pγ), (^{9}Be,2pnγ) or (^{12}C,α2pγ).
@ From $\gamma(\theta)$ and γ linear polarization in (p,p′γ).
& From (α,nγ).

Adopted Levels, Gammas (continued)

$\gamma(^{46}Ti)$

γ's from capture states in (p,γ) not included; see (p,γ).

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	δ	α[a]	Comments
889.286	2^+	889.277 *3*	100	0.0	0^+	E2		0.00017	E_γ,Mult.,α: from ^{46}Sc β^- decay. B(E2)(W.u.)=19.5 *6*.
2009.846	4^+	1120.545 *4*	100	889.286	2^+	E2			E_γ,Mult.: from ^{46}Sc β^- decay. B(E2)(W.u.)=20.2 *13*.
		2010	1.3×10^{-5} *10*	0.0	0^+	[E4]			B(E4)(W.u.)=4.E+2 *3* E_γ: assumed from ^{46}Sc β^- decay scheme and photoneutrons from Be. I_γ: from ^{46}Sc β^- decay.
2611.0	0^+	1721.81 *12*	100	889.286	2^+				B(E2)(W.u.)=50 *14*
2961.8	2^+	2072.6& *2*	100.0& *6*	889.286	2^+	E2+M1	−1.21 *14*		B(M1)(W.u.)=0.0058 *9*; B(E2)(W.u.)=5.2 *6* Mult.,δ: from (p,p′γ),(pol p,p′γ).
		2962.3& *7*	4.4& *6*	0.0	0^+				B(E2)(W.u.)=0.064 *16*
3058.46	3^-	96.5	11 *3*	2961.8	2^+	[E1]		0.0324	α(K)=0.0289; α(L)=0.00261 B(E1)(W.u.)=0.008 *4* E_γ,I_γ: from (p,p′γ) based on coincidence data.
		1048.76 *7*	100 *3*	2009.846	4^+	E1+M2	0.11 *3*		B(E1)(W.u.)=5.7×10^{-5} *17*; B(M2)(W.u.)=2.9 *18* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{16}O,2pγ), (^{9}Be,2pnγ), and (p,p′γ). I_γ,Mult.,δ: from (p,p′γ). Large B(M2)(W.u.) suggests that δ is too large.
		2169[b]	<3.3	889.286	2^+				
3168.00	1^-	2278.8 *2*	100 *2*	889.286	2^+				
		3168.1 *1*	83 *2*	0.0	0^+	[E1]			B(E1)(W.u.)=4.3×10^{-5} *6*
3213		2324@	100@	889.286	2^+				
3235.7	2^+	2346.5 *2*	100.0 *13*	889.286	2^+				
		3235.7 *7*	18.8 *13*	0.0	0^+	[E2]			B(E2)(W.u.)=0.89 *20*
3298.86	6^+	1289.1 *1*	100	2009.846	4^+	E2†			B(E2)(W.u.)=16.4 *15* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{16}O,2pγ), (^{9}Be,3nγ), (^{9}Be,2pnγ) and (^{12}C,α2pγ).
3441.39	4^-	382.95 *7*	100 *3*	3058.46	3^-				E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,2pnγ), (α,nγ), and (p,p′γ). I_γ: weighted average of values from (^{16}O,2pγ), (α,nγ), and (p,p′γ).
		1431.79 *17*	35 *3*	2009.846	4^+				E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,2pnγ), (α,nγ), and (p,p′γ). I_γ: weighted average of values from (^{16}O,2pγ), (α,nγ), and (p,p′γ).

Adopted Levels, Gammas (continued)

γ(^{46}Ti) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	Comments
3569.3	3⁻	1559.6[&] *2*	100	2009.846	4⁺	[E1]	B(E1)(W.u.)=0.0022 *8* I_γ: from (^{12}C,α2pγ).
		2680[‡]	27[‡]	889.286	2⁺	[E1]	B(E1)(W.u.)=0.00012 *4*
3571.7	0⁺	2682.5[&] *2*	100[&]	889.286	2⁺	[E2]	B(E2)(W.u.)=2.17 *18*
3579.8		1573[@] *1*	100[@]	2009.846	4⁺		
		2691[#]	<2	889.286	2⁺		I_γ: from (p,γ).
3610.2		2719[@] *1*	100[@]	889.286	2⁺		
3723.8	(2)⁺	1713.0[@] *10*	32[@] *9*	2009.846	4⁺		
		2834.6 *3*	100[@] *9*	889.286	2⁺		E_γ: weighted average of values from (α,nγ) and (p,p′γ).
3737.9	(1,2⁺)	3737.9[&] *3*	100[&]	0.0	0⁺		
3826.43	5⁻	529[‡]	30[‡]	3298.86	6⁺		
		768.0 *1*	70[‡]	3058.46	3⁻		E_γ: from (^{9}Be,2pnγ).
		1818[‡]	100[‡]	2009.846	4⁺		
3845.0	2⁺	2955.8[&] *4*	100[&]	889.286	2⁺		
3852.44	5⁻	411.1[@] *2*	5[@] *4*	3441.39	4⁻		I_γ: =10 from (^{12}C,α2pγ).
		553 *1*		3298.86	6⁺		E_γ: from (^{28}Si,2α2pγ); Iγ=10 from (^{12}C,α2pγ).
		794.2 *1*	14[@] *6*	3058.46	3⁻		E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,2pnγ) and (α,nγ).
		1842.65 *8*	100[@] *6*	2009.846	4⁺		E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ), (^{9}Be,2pnγ), and (α,nγ).
3856		1847	100	2009.846	4⁺		E_γ,I_γ: from (p,γ).
3889.3	2⁺	720[&]	100[&] *9*	3168.00	1⁻		
		2990[&]	25[&] *9*	889.286	2⁺		
3905.6	(1,2⁺)	1290[&]	43[&]	2611.0	0⁺		Not observed in (p,γ).
		1890[&]	<30[&]	2009.846	4⁺		I_γ: =24 from (p,γ).
		3016.3[&] *4*	43[&]	889.286	2⁺		I_γ: =73 from (p,γ).
		3905.7[&] *4*	100[&]	0.0	0⁺		
3941.9	4⁺	1932	100	2009.846	4⁺		E_γ: from (α,nγ) and (p,γ); ΔE not given.
4003.1		944.1[@]	100[@]	3058.46	3⁻		
4025.3	2⁺	860[&]	100[&] *8*	3168.00	1⁻		
		2030[&]	49[&] *8*				
		3140[&]	100[&] *8*	889.286	2⁺		
		4020[&]	22[&] *8*	0.0	0⁺		
4038.8		985[#]		3058.46	3⁻		
		3151[@]	100[@]	889.286	2⁺		
4130.1	2⁺	2128[#b]	100	2009.846	4⁺		

$^{46}_{22}Ti_{24}$-11

Adopted Levels, Gammas (continued)

γ(^{46}Ti) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	Comments
4178.7	3⁻	2168.0[@] *10*	100[@] *9*	2009.846	4⁺		
		3290.3[@] *15*	35[@] *9*	889.286	2⁺		
4191.5	3⁻	2182.0[@] *10*	19[@] *10*	2009.846	4⁺		
		3301.8[@] *15*	100[@] *10*	889.286	2⁺		
4315.8	1⁺	4316[&] *1*	100[&]	0.0	0⁺		
4322.6		1024[‡]	100[‡]	3298.86	6⁺		
4372.0	3⁻	2362[@]	100[@]	2009.846	4⁺		
4417.1	6⁻	588.3[@] *9*	<5.3[@]	3826.43	5⁻		
		974.2 *2*	100[@]	3441.39	4⁻		E_γ: weighted average of values from (^{9}Be,2pnγ) and (α,nγ).
4523.4	4⁺	1082		3441.39	4⁻		E_γ: from (^{12}C,α2pγ).
		1225[#]	100 *15*	3298.86	6⁺		I_γ: from (p,γ).
		1273[#]	54 *15*				I_γ: from (p,γ).
4662.30	6⁻	810.0 *2*	19[@] *6*	3852.44	5⁻		E_γ: weighted average of values from (^{28}Si,α2pγ),(^{9}Be,2pnγ) and (α,nγ).
		1220.8 *1*	100[@] *9*	3441.39	4⁻		E_γ: weighted average of values from (^{28}Si,α2pγ),(^{9}Be,3nγ), (^{9}Be,2pnγ) and (α,nγ).
		1364.0[@] *8*	38[@] *9*	3298.86	6⁺		
4697	(2⁺)	2687[@]	100[@]	2009.846	4⁺		
4726.4	(5⁻,6⁺)	2715[@]	100[@]	2009.846	4⁺		
4827.2	3⁻	1592[#]	100	3235.7	2⁺		E_γ,I_γ: from (p,γ).
		1659[#]	27	3168.00	1⁻		E_γ,I_γ: from (p,γ).
		2818[#]	10	2009.846	4⁺		E_γ,I_γ: from (p,γ).
4896.9	8⁺	1597.9 *2*	100	3298.86	6⁺	E2[†]	B(E2)(W.u.)=11.3 *14* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ), (^{9}Be,2pnγ) and (^{12}C,α2pγ).
5023.7	3⁻	1725	100	3298.86	6⁺		
5079	(4⁺)	1843[#]	100	3235.7	2⁺		
5180	⁺	2128[#b]	100	3058.46	3⁻		
5197.60	7⁻	471[‡]	8[‡]	4726.4	(5⁻,6⁺)		
		535		4662.30	6⁻		E_γ: from (^{28}Si,2α2pγ) and (α,nγ).
		1345.1 *1*	100[‡]	3852.44	5⁻	[E2]	B(E2)(W.u.)=11.2 *4* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ). Separated by 0.8 *8* from γ in decay of 6242 level according to (^{9}Be,2pnγ).
		1370[‡]	33[‡]	3826.43	5⁻		
5280	6⁺	1427[@]	100[@]	3852.44	5⁻		
5530	3⁻	2230[#]	100	3298.86	6⁺		E_γ,I_γ: from (p,γ).

$^{46}_{22}Ti_{24}$-12

Adopted Levels, Gammas (continued)

γ(^{46}Ti) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	α[a]	Comments
5530	3^-	2361[#]	67	3168.00	1^-			E_γ,I_γ: from (p,γ).
5794	4^+	2224[#]	100	3571.7	0^+			
5950	3^-	2715[#]	100	3235.7	2^+			
6025		1363[@]	100[@]	4662.30	6^-			
6150.5	8^-	1488.2 *3*	100	4662.30	6^-	E2[†]		B(E2)(W.u.)=22 *2* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ). I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ).
		1734 *1*	16.5	4417.1	6^-	E2[†]		E_γ: from (^{28}Si,2α2pγ). I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ). B(E2)(W.u.)=1.7 *2*.
6200.4	8^+	1304 *1*	65	4896.9	8^+	M1[†]		E_γ,I_γ: from (^{28}Si,2α2pγ).
		2902	100	3298.86	6^+	E2[†]		E_γ,I_γ: from (^{28}Si,2α2pγ).
6241.9	10^+	1345.1 *1*	100	4896.9	8^+	E2[†]		B(E2)(W.u.)=15.6 *7* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ), (^{9}Be,2pnγ) and (^{12}C,α2pγ). Separated by 0.8 *8* from γ in decay of 5197 level according to (^{9}Be,2pnγ).
6266		2679[#]	100	3579.8				
6395	4^+	2203[#]	100	4191.5	3^-			
6830.3	9^-	1632.6 *5*	100	5197.60	7^-	E2[†]		E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ). I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ). B(E2)(W.u.)=8.2 *9*.
		1933 *1*	16.5	4896.9	8^+	E1[†]		B(E1)(W.u.)=2.0×10^{-5} *2* E_γ: from (^{28}Si,2α2pγ). I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ).
7941.8	11^+	1699.8 *4*	100	6241.9	10^+	M1[†]		B(M1)(W.u.)=0.014 *4* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ).
7960.8	10^-	1810.7 *7*	100	6150.5	8^-	E2[†]		E_γ: weighted average of values from (^{28}Si,2α2pγ) and (^{9}Be,2pnγ).
8217.5	12^+	275.3 *1*	45	7941.8	11^+	M1[†]	0.00154	B(M1)(W.u.)=0.64 *6* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ). I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ).
		1976.2 *9*	100	6241.9	10^+	E2[†]		E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ). I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ). B(E2)(W.u.)=3.8 *4*.
8283.9	$10,11,12^+$	2041	100	6241.9	10^+	(E2+M1)		E_γ,I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ).
8716.2	11^-	1887 *1*	100	6830.3	9^-	E2[†]		E_γ,I_γ: from (^{28}Si,2α2pγ) and (^{12}C,α2pγ).

$^{46}_{22}Ti_{24}$-13

Adopted Levels, Gammas (continued)

$\gamma(^{46}Ti)$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	Comments
10041.6	$12^+,14^+$	1823.1 *5*	100	8217.5	12^+	E2[†]	B(E2)(W.u.)=5 *2* E_γ: weighted average of values from (^{28}Si,2α2pγ), (^{9}Be,3nγ) and (^{9}Be,2pnγ).
		2100		7941.8	11^+		E_γ: from (^{12}C,α2pγ).
10380		2163		8217.5	12^+		E_γ: from (^{28}Si,2α2pγ).
12974		2594		10380			E_γ: from (^{28}Si,2α2pγ).
13169		195 *1*		12974			E_γ: from (^{28}Si,2α2pγ).

† From (^{28}Si,2α2pγ) and/or (^{9}Be,2pnγ).
‡ From (^{12}C,α2pγ).
# From (p,γ); ΔE not given.
@ From (α,nγ).
& From (p,p′γ).
[a] 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.
[b] Placement of transition in the level scheme is uncertain.

$^{46}_{22}Ti_{24}$-14

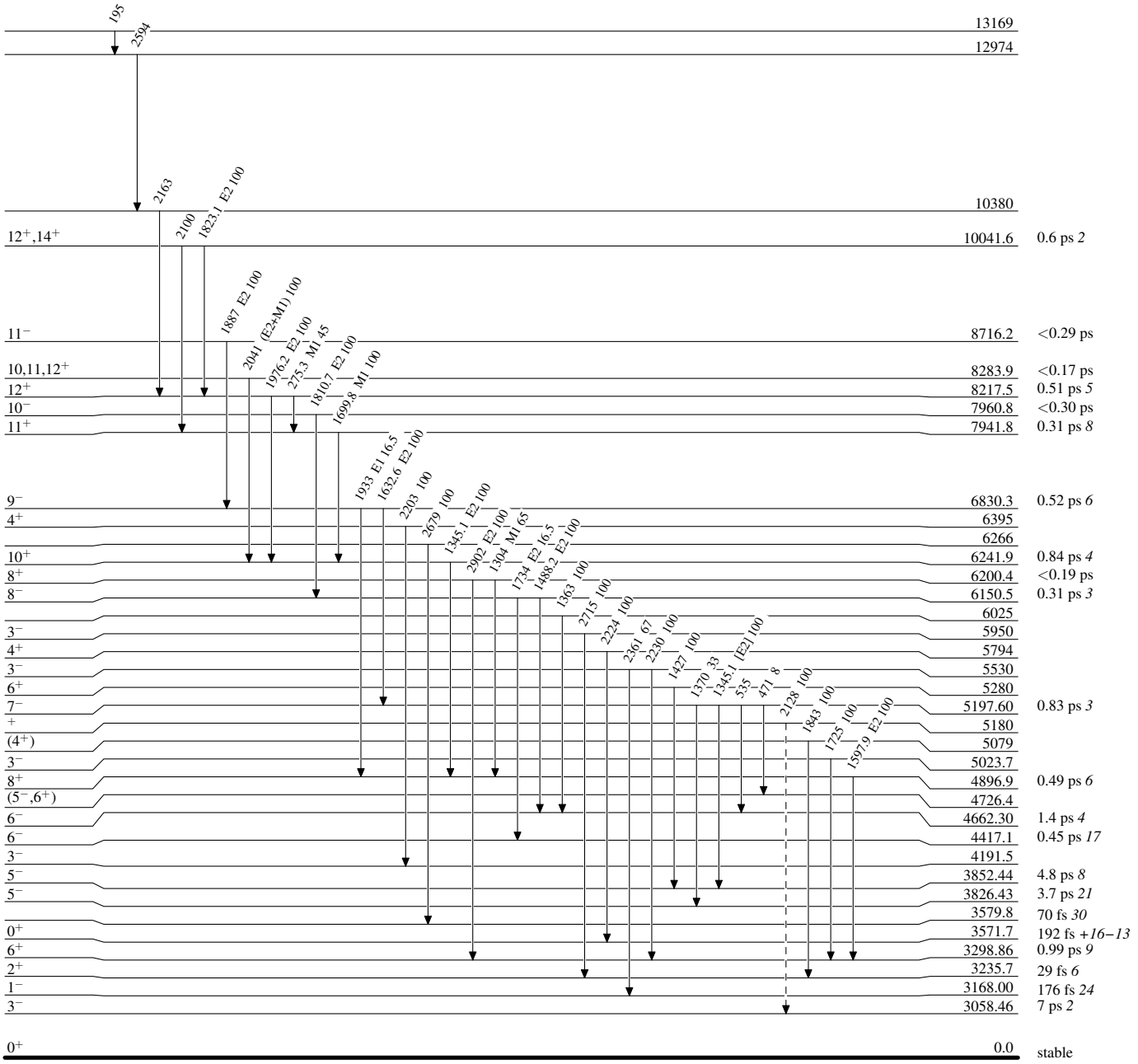
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{46}_{22}Ti_{24}$

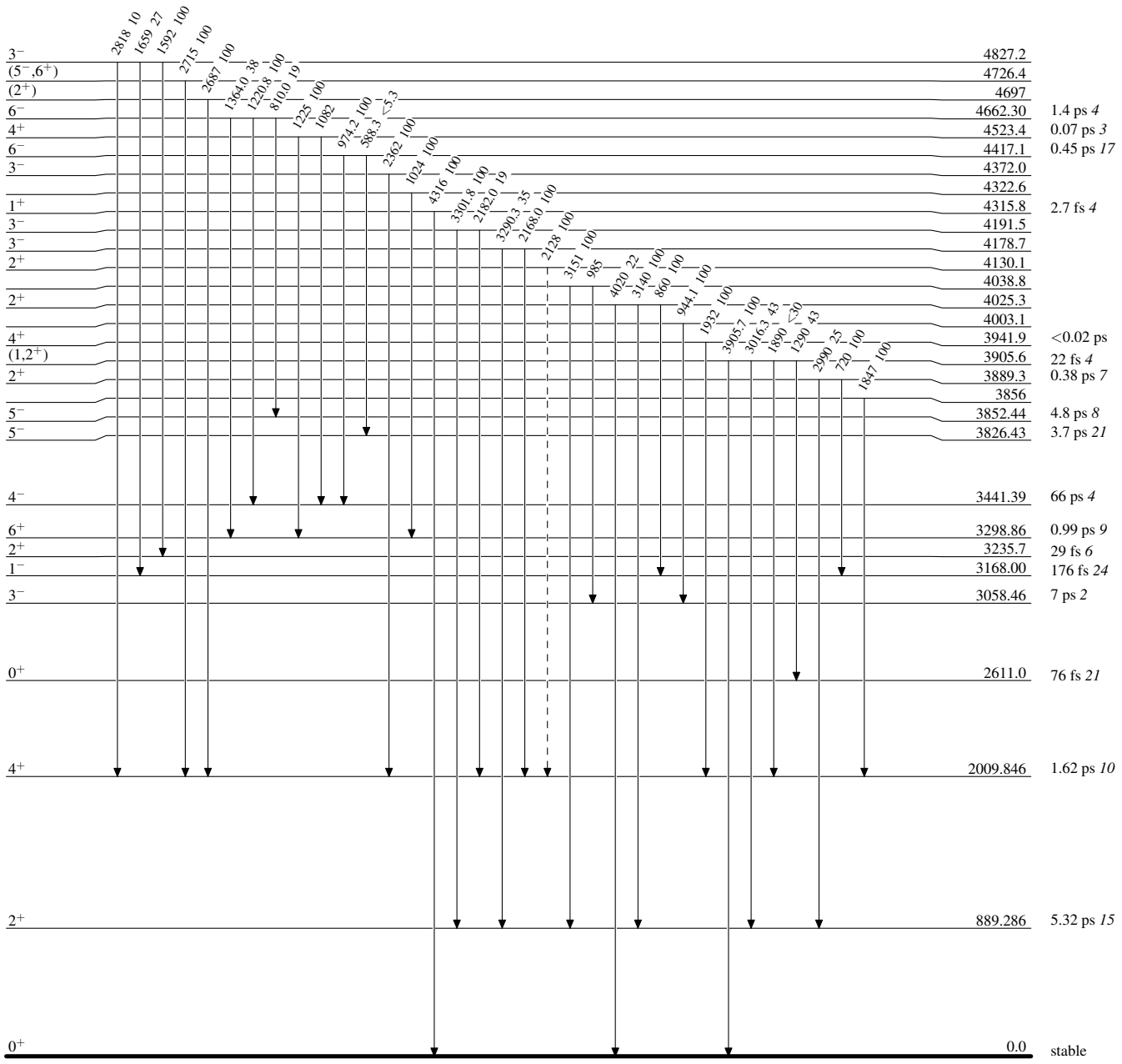
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{46}_{22}Ti_{24}$

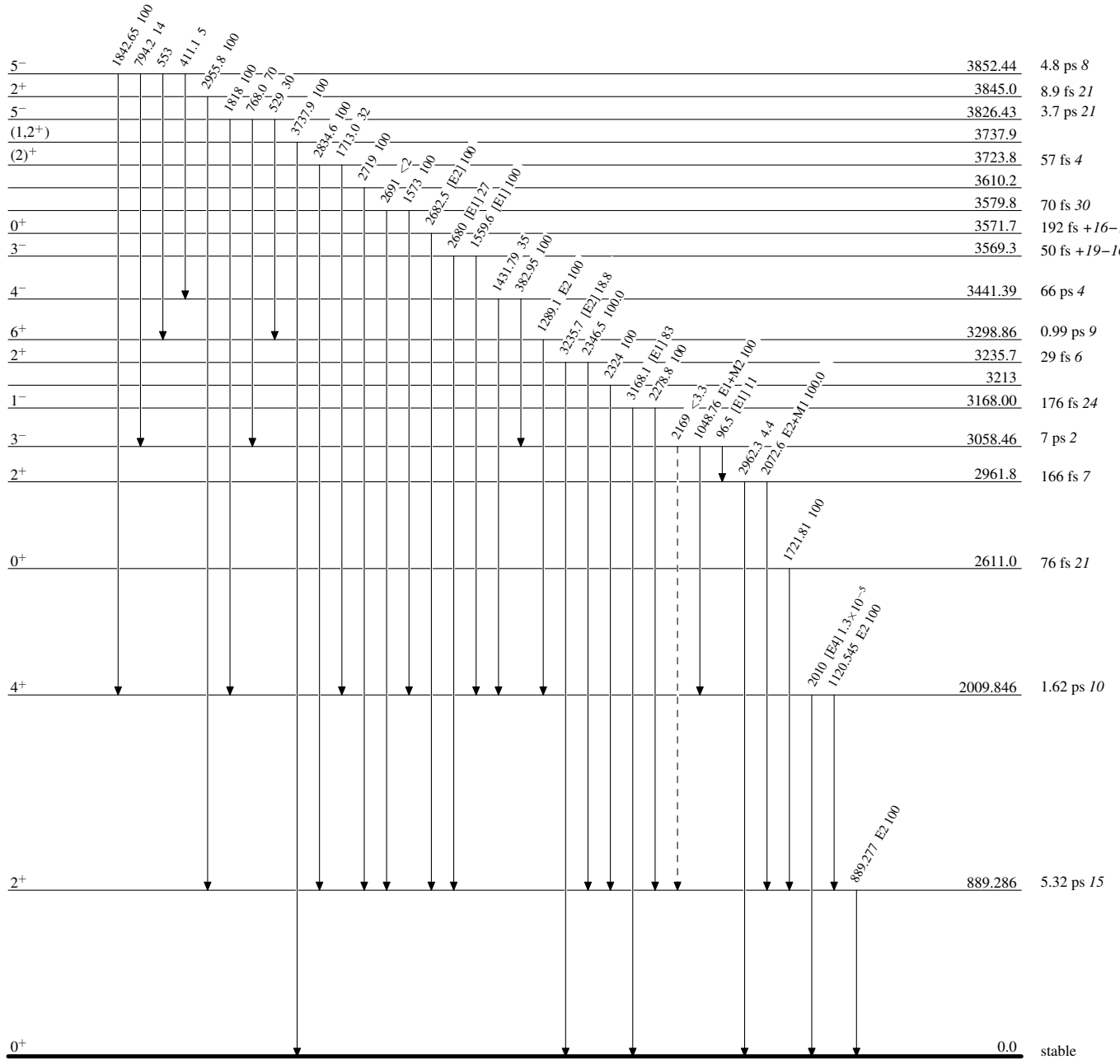
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{46}_{22}Ti_{24}$