Adopted Levels, Gammas

History

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

Q(β^-)=−7129 *8*; S(n)=9531.9 *12*; S(p)=8482.1 *20*; Q(α)=−6296.1 *9* 2012Wa38
Note: Current evaluation has used the following Q record −7126 17 *9528.6 128478.6 20*−6292.9 *10* 2003Au03.

^{45}Ti Levels

Cross Reference (XREF) Flags

A	^{45}V β^+ decay	E	^{42}Ca(α,nγ)	I	^{46}Ti(p,d),(d,t),(^{3}He,α)
B	(HI,xnγ)	F	^{44}Ca(pol p,π^-), ^{45}Sc(p,n)	J	^{44}Ti(n,γ) E=th
C	^{24}Mg(^{24}Mg,2pnγ) E=83 MeV	G	^{45}Sc(p,n),(p,nγ)		
D	^{30}Si(^{18}O,3nγ)	H	^{45}Sc(^{3}He,t) E=24.6 MeV IAR		

T(B) TV From γ(t) in (α,nγ) and γ(t) in (p,nγ), respectively. Other $T_{1/2}$'s:

E_x	(HI,xnγ) RDM	nγ(t)	(α,nγ),(p,nγ) γ(t)	(α,nγ)	γ(t)	(p,nγ) γ(t)	DSAM
40	12.3 ns *9*		11.9 ns *7*	11.85 ns *42*		11.5 ns *15*	
330	1.19 ns *7*	1.2 ns					
							>693 fs

E(level)[†]	J^π[‡]	$T_{1/2}$[#]	XREF	Comments
0.0[@]	7/2⁻	184.8 min *5*	ABCDEFGHI	%ε+%β⁺=100 μ=0.095 *2*; Q=0.015 *15* (2005St24,1966Co19) T=1/2 J^π: J=7/2 from AB (1976Fu06,1966Co19); π=− from L=3 in (p,d),(d,t),(^{3}He,α). $T_{1/2}$: from 1966Po04 (chem; pc 10 $T_{1/2}$). μ,Q: AB. Polarization correction for Q. μ/Q>0. ^{47,49}Ti standards.
36.53 *15*	3/2⁻	3.0 μs *2*	BCDE G I	J^π: E2(+M1) γ to 7/2⁻ and D,E2 γ from 1/2⁺, 1565. $T_{1/2}$: weighted av of 2.9 μs *3* from RDM in (HI,xnγ) and 3.1 μs *3* from γ(t) in (p,nγ).
39.39 *23*	5/2⁻	11.29 ns *9*	ABCDE G	μ=−0.133 *10* (2005St24,1977Br15) J^π: 5/2 from γ(θ) in (α,nγ). D,E2 γ from 9/2⁻, 1353. μ: DPAD. Other: −0.08 *3* (1977St12,DPAD).
329.30[&] *15*	3/2⁺	1.099 ns *13*	BCDE G I	μ=+1.05 *24* (1989Ra17,1977Bu10,1975Ha47) J^π: L=2 in (p,d),(d,t),(^{3}He,α). Shape of σ(θ) in (^{3}He,α) identical to that for g.s., 3/2⁺ of ^{39}Ca. μ: IPAD, recalculated by 1977Bu10. 2005St24 cite a rounded−off value of +1.1 *3*. Configuration: calculation by 1977La12 indicates that a contribution of f7/2 nucleons is required to reproduce μ.
743.88[b] *17*	5/2⁺	10.5[a] ps *17*	BCDE G	J^π: from γ(θ) in (α,nγ) and M1+E2 γ to 3/2⁺.
1226.50[&] *15*	7/2⁺[c]	2.8[a] ps *6*	BCDE G	
1353.49[e] *18*	9/2⁻	0.103[d] ps *9*	CDE G I	J^π: from γ(θ) in (p,nγ) and M1+E2 γ to 7/2⁻.
1468.24[@] *14*	11/2⁻[c]	0.48[d] ps *7*	BCDE G I	
1521.7 *6*	3/2⁻ to 9/2⁻	48[d] fs *11*	E G	J^π: 3/2⁻ to 11/2⁻ from D,E2 γ to 7/2⁻. Ne 9/2,11/2⁻ if D,E2 γ to 3/2⁻; Ne 9/2⁺,11/2⁻ if D,E2 γ to 5/2⁻.
1565.4[f] *7*	1/2⁺	>2.8 ps	E I	
1799.0 *15*	(1/2⁻ to 7/2⁻)	0.32[d] ps +22−8	E G I	
1881.76[b] *19*	9/2⁺	0.68 ps +6−5	BCDE G	J^π: from γ(θ) in (α,nγ) and E2 γ to 5/2⁺.

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Adopted Levels, Gammas (continued)

^{45}Ti Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	XREF	Comments
				$T_{1/2}$: weighted ave(int.) of 0.69 ps *7* from DSAM in (^{18}O,3nγ), 0.69 ps *14* from DSAM in (α,nγ), 0.62 ps *+21−14* from DSAM in (p,nγ), and 1.1 ps *6* from RDM in (HI,xnγ).
1958.2[f] *4*	$3/2^+$	0.83 ps *14*	E G I	J^{π}: 3/2,5/2 from anisotropy of 1214γ, Ne 5/2 from $\gamma(\theta)$ and n$\gamma(\theta)$ in (α,nγ). M1+E2 γ to $5/2^+$.
2014.7 *6*	$3/2^-$ to $9/2^-$	32[d] fs *9*	E G	J^{π}: $3/2^-$ to $11/2^-$ from D,E2 γ to $7/2^-$. Ne $9/2,11/2^-$ if D,E2 γ to $3/2^-$; Ne $9/2^+,11/2^-$ if D,E2 γ to $5/2^-$.
2258.2[f] *6*	$5/2^+$	0.194 ps *35*	E G I	J^{π}: 5/2 from n$\gamma(\theta)$ in (α,nγ); M1+E2 γ to $5/2^+$.
2432.1 *15*	3/2 to 11/2		G	J^{π}: γ to $7/2^-$.
2474.58[&] *21*	$11/2^+$	0.39 ps *6*	CDE	J^{π}: 7/2,11/2 from $\gamma(\theta)$ and n$\gamma(\theta)$ in (α,nγ); ΔJ=2 E2(+M3) γ to $7/2^+$. $T_{1/2}$: weighted av of 0.45 ps *9* from DSAM in (α,nγ) and 0.35 ps *7* from DSAM in (^{18}O,3nγ).
2500 *20*	$5/2^-,7/2^-$		I	
2531.4 *12*	$1/2,3/2,5/2^{(+)}$[g]		E	
2656.66[e] *18*	$13/2^-$	<0.17[h] ps	BCDE	J^{π}: 13/2 from $\gamma(\theta)$ in (HI,xnγ). M1+E2 γ to $11/2^-$.
2849.4 *12*	$1/2,3/2,5/2^{(+)}$[g]		E	
2890 *20*	$(3/2^+,5/2^+)$		I	
2911.6[f] *6*	$7/2^+$	0.36 ps *8*	E	J^{π}: $5/2^+,7/2^+$ from D,E2 γ to $3/2^+$, 1958, and M1+E2 γ to $9/2^+$; Ne 5/2 from n$\gamma(\theta)$ in (α,nγ).
2932.9 *9*	$(13/2^+)$[i]		D	
3000 *20*	$(3/2^+,5/2^+)$		I	
3015.37[@] *18*	$15/2^-$	0.55[h] ps *14*	BCDE	J^{π}: 15/2 from $\gamma(\theta)$ in (HI,xnγ); π=− from M1+E2 γ to $13/2^-$.
3080 *20*	$(3/2^+,5/2^+)$		I	
3156.0 *11*			E	
3200 *20*			I	
3400 *20*	$(3/2^+,5/2^+)$		I	
3447.31[b] *23*	$13/2^+$	0.180[h] ps *21*	CD	J^{π}: D,E2 γ to $11/2^+$ and ΔJ=0 d or ΔJ=2 E2 to $9/2^+$; member of band based on $d_{3/2}$ orbital.
3540 *20*	$3/2^+,5/2^+$		I	
3601.87[e] *21*	$17/2^-$	0.90[h] ps *7*	BCD	J^{π}: ΔJ=1 M1+E2 γ to $15/2^-$ and ΔJ=2 E2 γ to $13/2^-$.
3830 *20*	$1/2^+$		I	
3922.45[&] *25*	$15/2^+$	0.312[h] ps *21*	CD	J^{π}: D γ to $13/2^+$ and ΔJ=0 d or ΔJ=E2 γ to $11/2^+$. Member of band based on $d_{3/2}$ orbital.
3937.6 *11*	(11/2 to 15/2)		E	J^{π}: from γ excit in (α,nγ).
4344.9[@] *3*	$19/2^-$	0.104[h] ps *14*	CD F	J^{π}: ΔJ=1 M1 γ to $17/2^-$ and D,E2 γ to $15/2^-$. Member of band based on $f_{7/2}$ orbital.
4723[j] *7*	$(7/2)^-$		HI	T=3/2 E(level): unweighted av of 4716 *6* from (p,d),(d,t),(^{3}He,α) and 4730 *7* from (^{3}He,t). J^{π}: $5/2^-,7/2^-$ from L=3 in (p,d),(d,t),(^{3}He,α). IAS(^{45}Sc g.s.).
4810[j] *20*	$3/2^+,5/2^+$		I	T=3/2
4855.2 *9*	$(17/2^+)$	0.35[h] ps *5*	D	
5030 *20*	$(3/2^+,5/2^+)$		I	
5180 *20*	$1/2^-,3/2^-$		I	
5239.9[b] *3*	$(17/2^+)$	0.07[h] ps *6*	CD	J^{π}: γ's to $15/2^+$ and $13/2^+$. Member of band based on $d_{3/2}$ orbital.
5330 *20*	$3/2^+,5/2^+$		I	
5540 *20*			I	
5640.9[&] *4*	$19/2^+$	0.19[h] ps *6*	CD	J^{π}: D γ to $(17/2^+)$ and ΔJ=0 d or ΔJ=2 E2 γ to $15/2^+$.

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Adopted Levels, Gammas (continued)

^{45}Ti Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	XREF	Comments
				Member of band based on $d_{3/2}$ orbital.
5760[j] *20*	$1/2^+$		I	T=3/2
6006.7 *9*			D	
6163.0[@k] *5*	$23/2^-$	0.35[h] ps *4*	BCD F	J^{π}: ΔJ=2 E2 γ to $19/2^-$. Member of band based on $f_{7/2}$ orbital.
6459.9 *8*	$(21/2^+)$[i]		D	
6757.9[b] *7*	$(21/2^+)$		D	J^{π}: γ's to $(17/2^+)$ and $19/2^+$. Member of band based on $d_{3/2}$ orbital.
7143.4[@k] *6*	$27/2^-$	10.4[h] ps *14*	BCD F	J^{π}: ΔJ=2 E2 γ to $23/2^-$. Member of band based on $f_{7/2}$ orbital.
7342.0[&] *8*	$(23/2^+)$		D	J^{π}: γ's to $(21/2^+)$ and $19/2^+$. Member of band based on $d_{3/2}$ orbital.
7830.7 *8*			D	
8289.2 *8*	$(25/2^+)$[i]		D	
9643.5 *12*		<0.07[h] ps	D	
10153.5[l] *12*	$(25/2^-)$	<0.07[h] ps	D	J^{π}: ΔJ=1 (D) to $27/2^-$. Possible member of band based on $f_{7/2}$ orbital.
10795.3 *13*	$(29/2^+)$[i]		D	
12498.6[kl] *16*	$(29/2^-)$	<0.07[h] ps	D	J^{π}: D,E2 γ to $(25/2^-)$. Possible member of band based on $f_{7/2}$ orbital.
13030.4 *17*	$(33/2^+)$[i]		D	

[†] From least-squares fit to Eγ assuming ΔE(γ)=1 keV when not given, except as noted. Eγ deduced from Eγ(to 40)−3.3 *3* in (p,nγ) excluded from least-squares analysis.
[‡] From angular momentum transfer in (p,d),(d,t),(^{3}He,α), except as noted.
[#] From DSAM in (α,nγ), except as noted.
[@] Band(A): Band based on $f_{7/2}$ orbital, α=−1/2 (2006Be07). Identified as members of a π=− γ cascade by 1998Be29. 1998Be29 extended negative parity states given in 1992Bu01 from 7144 keV to 12499 keV.
[&] Band(B): Band based on $d_{3/2}$ orbital, α=−1/2 (1998Be29,2004Be20,2006Be07). 1998Be29 extended the band labeled as $K^{\pi}=3/2^+$ in 1992Bu01 from 2476 keV to 5639 keV. Further extended by 2004Be20 to 7340. Confirmed by 2006Be07 through 5639.
[a] From RDM in (HI,xnγ). Others: $T_{1/2}$(744)≥1 ps and $T_{1/2}$(1227)≥1.5 ps from DSAM in (p,Nγ).
[b] Band(C): Band based on $d_{3/2}$ orbital, α=+1/2 (1998Be29,2004Be20,2006Be07). 1998Be29 extended the band labeled as $K^{\pi}=3/2^+$ in 1992Bu01 from 2476 keV to 5639 keV. Further extended by 2004Be20 to 7340. Confirmed by 2006Be07 through 5639.
[c] From $\gamma(\theta)$, γ excit, and linear polarization in (α,nγ).
[d] From DSAM in (p,nγ). Other DSAM in (p,nγ): $T_{1/2}$(1354)=0.103 ps *24*, $T_{1/2}$(1468)=464 fs *+114−89*, $T_{1/2}$(1521)=55 fs *9*.
[e] Band(D): Band based on $f_{7/2}$ orbital, α=+1/2 (2006Be07). Identified as members of a π=− γ cascade by 1998Be29. 1998Be29 extended negative parity states given in 1992Bu01 from 7144 keV to 12499 keV.
[f] Band(E): $K^{\pi}=1/2^+$ band (1984Ka05).
[g] γ to $1/2^+$.
[h] From DSAM in (^{18}O,3nγ).
[i] Band(M): $(13/2^+)$ intruder band (2004Be20). Based on the relatively high β≈0.45 reached for this new band, extended shell model calculations, and resemblance to the T=0 g.s. band in ^{46}V (1999Ol01).
[j] Isobaric analog states of ^{45}Sc g.s., 12.4?, and 938?
[k] Weakly excited or not observed in ^{44}Ca(p,π^-), ^{45}Sc(p,n).
[l] Band(F): π=− γ cascade (1998Be29). May Be members of the band based on $f_{7/2}$ orbital, α=+1/2 (evaluator). 1998Be29 extended negative parity states given in 1992Bu01 from 7144 keV to 12499 keV.

$\gamma(^{45}Ti)$

See (HI,xnγ) and (α,nγ) for unplaced gammas.

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E(G)      TV   Weighted averages of the following:
Adopted     (24Mg,2pnγ)        (p,nγ)      (α,nγ)           (HI,xnγ)
 414.36 18      414.0 2        414.45 10                                           TVExternal
 482.61 14      482.4 2                     482.9 2       482.56 15      TVExternal
 707.47 16      706.9 3                     707.5 2       707.7 2          TVExternal
 897.27 12      897.2 2                     897.5 2       897.1 2          TVInternal
1137.8 2       1138.2 2                    1137.9 2      1137.8 2          TVInternal
1225.94 21     1225.8 2       1227 1          1227 1        1226.6 7         TVExternal
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E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[r]	Comments
36.53	3/2⁻	36.69 *21*	100	0.0	7/2⁻	(E2)		16.6 *5*	α(K)=14.7 *4*; α(L)=1.73 *5*; α(M)=0.213 *6*; α(N+..)=0.00799 *21* α(N)=0.00799 *21* B(E2)(W.u.)=30 *24* Mult.,δ: E2(+M1), >0.33 from comparison to RUL and α(exp) in (p,nγ). ΔJ^π=2, no from level scheme.
39.39	5/2⁻	40.15[#] *30*	100[#]	0.0	7/2⁻	(M1(+E2))	0.000 *25*	0.223 *10*	B(M1)(W.u.)=0.00246 *7* α(K)=0.201 *9*; α(L)=0.0190 *9*; α(M)=0.00242 *11*; α(N+..)=0.000126 *5* α(N)=0.000126 *5* Mult.,δ: from $\gamma(\theta)$ in (α,nγ) and comparison to RUL. $\Delta\pi$=no from decay scheme.
329.30	3/2⁺	289.5[#] *3*	0.55[#] *25*	39.39	5/2⁻	(E1,M2)[@]		0.0036 *25*	B(E1)(W.u.)<1.1×10^{-7} *5*; B(M2)(W.u.)<6 *3* α(K)=0.0032 *23*; α(L)=0.00030 *21*; α(M)=4.E−5 *3*; α(N+..)=2.0×10^{-6} *15* α(N)=2.0×10^{-6} *15*
		292.77[#] *5*	100.00[#] *25*	36.53	3/2⁻	E1(+M2)	≤0.032[&]	1.08×10^{-3} *2*	B(E1)(W.u.)=1.927×10^{-5} *25*; B(M2)(W.u.)≤1.055 *14* α(K)=0.000978 *14*; α(L)=8.76×10^{-5} *13*; α(M)=1.118×10^{-5} *16*; α(N+..)=6.01×10^{-7} *9* α(N)=6.01×10^{-7} *9* Mult.: from α(exp) in (HI,xnγ). Mult.: from γ(Q) and α(exp) in (HI,xnγ).
743.88	5/2⁺	414.36 *18*	100.0[#] *16*	329.30	3/2⁺	M1+E2	+0.40 *3*	7.27×10^{-4} *22*	B(M1)(W.u.)=0.023 *4*; B(E2)(W.u.)=58 *12* α(K)=0.000660 *20*; α(L)=5.95×10^{-5} *18*; α(M)=7.60×10^{-6} *23*; α(N+..)=4.09×10^{-7} *12* α(N)=4.09×10^{-7} *12*

$^{45}_{22}Ti_{23}$-4

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[r]	Comments
									Mult.: from $\gamma(\theta)$ and $n\gamma(\theta)$ in $(\alpha,n\gamma)$ and α(exp) in (HI,xnγ). δ: from $\gamma(\theta)$ and $n\gamma(\theta)$ in $(\alpha,n\gamma)$.
743.88	5/2+	703.9[#] *11*	2.8[#] *6*	39.39	5/2−	(E1)[@]		0.0001100 *16*	B(E1)(W.u.)=3.7×10^{-6} *10* α(K)=9.96×10^{-5} *15*; α(L)=8.89×10^{-6} *13*; α(M)=1.137×10^{-6} *17* α(N+..)=6.16×10^{-8} *9* α(N)=6.16×10^{-8} *9*
		707.47[a] *16*	7.8 *14*	36.53	3/2−	(E1+M2)[b]	+0.06 *+5−4*	1.10×10^{-4} *4*	B(E1)(W.u.)=1.01×10^{-5} *25*; B(M2)(W.u.)=0.3 *+6−3* α(K)=0.000100 *4*; α(L)=8.9×10^{-6} *3*; α(M)=1.14×10^{-6} *4*; α(N+..)=6.17×10^{-8} *20* α(N)=6.17×10^{-8} *20*
		744[#]	0.22[#] *11*	0.0	7/2−	(E1,M2)[@c]		0.00026 *17*	B(E1)(W.u.)<2.4×10^{-7} *14*; B(M2)(W.u.)<2.0 *12* α(K)=0.00024 *15*; α(L)=2.1×10^{-5} *14*; α(M)=2.7×10^{-6} *17*; α(N+..)=1.5×10^{-7} *10* α(N)=1.5×10^{-7} *10*
1226.50	7/2+	482.61 *14*	98.1[d] *32*	743.88	5/2+	M1+E2[ce]	+0.28[e] *3*	4.57×10^{-4} *11*	B(M1)(W.u.)=0.028 *7*; B(E2)(W.u.)=25 *8* α(K)=0.000415 *10*; α(L)=3.73×10^{-5} *9*; α(M)=4.77×10^{-6} *11*; α(N+..)=2.58×10^{-7} *6* α(N)=2.58×10^{-7} *6*
		897.27 *12*	100.0[d] *57*	329.30	3/2+	E2(+M3)[e]	≤0.0011[&]	0.0001590 *23*	B(E2)(W.u.)=16 *4*; B(M3)(W.u.)≤1.7×10^{2} *4* α(K)=0.0001442 *21*; α(L)=1.292×10^{-5} *18*; α(M)=1.652×10^{-6} *24* α(N+..)=8.93×10^{-8} *13* α(N)=8.93×10^{-8} *13*
		1188.03 *35*	17.6[d] *25*	39.39	5/2−	(E1(+M2))[b]	0.00 *6*	8.55×10^{-5} *13*	B(E1)(W.u.)=8.7×10^{-6} *23*; B(M2)(W.u.)<0.10 *3* α(K)=3.48×10^{-5} *6*; α(L)=3.10×10^{-6} *6*; α(M)=3.96×10^{-7} *7*; α(N+..)=4.72×10^{-5} *8* α(N)=2.15×10^{-8} *4*; α(IPF)=4.72×10^{-5} *8* E_γ: weighted av of 1185.8 *2* from (^{24}Mg,2pnγ), 1188.61 *20* from (HI,xnγ), 1187 *1* from (p,nγ), and 1187.9 *3* from (α,nγ). 1188.03 *35* is the mean of 1188.13 *35* (LWM) and 1187.92 *26* (RT) with ΔE(γ) from RT.
		1225.94 *21*	13.8[d] *38*	0.0	7/2−	(E1+M2)[b]	−0.34 *6*	1.10×10^{-4} *2*	B(E1)(W.u.)=5.6×10^{-6} *20*; B(M2)(W.u.)=2.0 *10*

From ENSDF

Adopted Levels, Gammas (continued)

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[r]	Comments
									α(K)=4.1×10^{-5} *3*; α(L)=3.7×10^{-6} *3*; α(M)=4.7×10^{-7} *4*; α(N+..)=6.4×10^{-5} *3* α(N)=2.56×10^{-8} *18*; α(IPF)=6.4×10^{-5} *3*
1353.49	9/2$^-$	1314.0[#] *10*	7.8[#] *8*	39.39	5/2$^-$	(E2)[f]		9.68×10^{-5} *14*	B(E2)(W.u.)=10.7 *15* α(K)=5.87×10^{-5} *9*; α(L)=5.24×10^{-6} *8*; α(M)=6.71×10^{-7} *10*; α(N+..)=3.22×10^{-5} *6* α(N)=3.64×10^{-8} *6*; α(IPF)=3.22×10^{-5} *5*
		1353.6 *2*	100.0[#] *8*	0.0	7/2$^-$	M1+E2[e]	−0.39 *10*	8.45×10^{-5} *18*	B(M1)(W.u.)=0.069 *8*; B(E2)(W.u.)=16 *7* α(K)=4.80×10^{-5} *9*; α(L)=4.28×10^{-6} *8*; α(M)=5.48×10^{-7} *10*; α(N+..)=3.16×10^{-5} *9* α(N)=2.98×10^{-8} *6*; α(IPF)=3.16×10^{-5} *9* δ: weighted av of −0.51 +*8*−*18* from (α,nγ) and −0.34 *12* from (p,nγ); $\gamma(\theta)$.
1468.24	11/2$^-$	114[g]	1[g]	1353.49	9/2$^-$	(M1)[h]		0.01339	B(M1)(W.u.)=0.31 *5* α(K)=0.01212 *17*; α(L)=0.001115 *16*; α(M)=0.0001424 *20*; α(N+..)=7.58×10^{-6} *11* α(N)=7.58×10^{-6} *11*
		1468.14[a] *15*	100[g]	0.0	7/2$^-$	E2(+M3)	≤0.0005	0.0001280 *18*	B(E2)(W.u.)=18 *3*; B(M3)(W.u.)≤14.6 *22* α(K)=4.65×10^{-5} *7*; α(L)=4.15×10^{-6} *6*; α(M)=5.30×10^{-7} *8*; α(N+..)=7.64×10^{-5} *11* α(N)=2.88×10^{-8} *4*; α(IPF)=7.64×10^{-5} *11*
1521.7	3/2$^-$ to 9/2$^-$	1484[s#t] *1*	1.0×10^2[s#] *5*	39.39	5/2$^-$	D,E2[&]			
		1484[s#t] *1*	1.0×10^2[s#] *5*	36.53	3/2$^-$	D,E2[&]			
		1521[#] *1*	7.×10^1[#] *5*	0.0	7/2$^-$	D,E2[&]			
1565.4	1/2$^+$	1236 *1*	100.0 *23*	329.30	3/2$^+$	D,E2[&]			B(M1)(W.u.)<0.0036; B(E2)(W.u.)<6.4
		1528 *1*	14.9 *23*	36.53	3/2$^-$	(E1)[@]		0.000309 *5*	B(E1)(W.u.)<7.0×10^{-6} α(K)=2.27×10^{-5} *4*; α(L)=2.02×10^{-6} *3*; α(M)=2.58×10^{-7} *4*; α(N+..)=0.000284 *4* α(N)=1.404×10^{-8} *20*; α(IPF)=0.000284 *4*

$^{45}_{22}Ti_{23}$-6

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[r]	Comments
1799.0	(1/2⁻ to 7/2⁻)	1761[s#t] *2*	100[s#]	39.39	5/2⁻	D,E2[&]			
		1761[s#t] *2*	100[s#]	36.53	3/2⁻	D,E2[&]			
1881.76	9/2⁺	655.2[a] *2*	35.6[a] *5*	1226.50	7/2⁺	M1+E2[c]	+0.27 *+12−7*	2.27×10^{-4} *11*	B(M1)(W.u.)=0.028 *3*; B(E2)(W.u.)=13 *11* α(K)=0.000206 *10*; α(L)=1.84×10^{-5} *9*; α(M)=2.36×10^{-6} *12*; α(N+..)=1.28×10^{-7} *6* α(N)=1.28×10^{-7} *6*
		1137.8 *2*	100.0[a] *14*	743.88	5/2⁺	E2(+M3)[i]	≤0.00028	9.18×10^{-5} *13*	B(E2)(W.u.)=33 *7*; B(M3)(W.u.)≤14 *3* α(K)=8.09×10^{-5} *12*; α(L)=7.24×10^{-6} *11*; α(M)=9.26×10^{-7} *13*; α(N+..)=2.68×10^{-6} *4* α(N)=5.02×10^{-8} *7*; α(IPF)=2.63×10^{-6} *4*
1958.2	3/2⁺	1214.3 *3*	100 *5*	743.88	5/2⁺	M1+E2		8.0×10^{-5} *9*	α(K)=6.4×10^{-5} *7*; α(L)=5.7×10^{-6} *6*; α(M)=7.3×10^{-7} *8*; α(N+..)=9.7×10^{-6} *18* α(N)=4.0×10^{-8} *4*; α(IPF)=9.6×10^{-6} *18* δ: +0.47 *+29−14* or +3.7 *+77−16*.
		1920 *1*	18 *5*	39.39	5/2⁻	(E1,M2)[@]		0.00038 *22*	B(E1)(W.u.)<1.4×10^{-5} *5*; B(M2)(W.u.)<18 *6* α(K)=3.0×10^{-5} *14*; α(L)=2.6×10^{-6} *13*; α(M)=3.4×10^{-7} *16*; α(N+..)=0.00035 *24* α(N)=1.8×10^{-8} *9*; α(IPF)=0.00035 *24*
2014.7	3/2⁻ to 9/2⁻	1976[s#t] *1*	100.0[s#] *19*	39.39	5/2⁻	D,E2[&]			
		1976[s#t] *1*	100.0[s#] *19*	36.53	3/2⁻	D,E2[&]			
		2016[#] *1*	88.7[#] *19*	0.0	7/2⁻	D,E2[&]			
2258.2	5/2⁺	301 *1*	6 *4*	1958.2	3/2⁺	(E2)[&f]		0.00501 *10*	α(K)=0.00454 *9*; α(L)=0.000413 *8*; α(M)=5.26×10^{-5} *10*; α(N+..)=2.77×10^{-6} *6* α(N)=2.77×10^{-6} *6* the calculated transition strength for this γ gives B(E2)(W.u.)=$4.\times10^{3}$ *3*, which well exceeds the RUL.
		691.0 *15*	4 *3*	1565.4	1/2⁺	(E2)[f]		0.000323 *5*	B(E2)(W.u.)=4.E+1 *4* α(K)=0.000293 *5*; α(L)=2.63×10^{-5} *4*;

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[r]	Comments
									α(M)=3.36×10^{-6} *6*; α(N+..)=1.81×10^{-7} *3* α(N)=1.81×10^{-7} *3*
2258.2	5/2$^+$	1514 *1*	74 *8*	743.88	5/2$^+$	M1+E2	+1.4 *+3−5*	1.31×10^{-4} *7*	B(M1)(W.u.)=0.0044 *16*; B(E2)(W.u.)=10 *3* α(K)=4.18×10^{-5} *13*; α(L)=3.73×10^{-6} *12*; α(M)=4.77×10^{-7} *15*; α(N+..)=8.5×10^{-5} *6* α(N)=2.60×10^{-8} *8*; α(IPF)=8.5×10^{-5} *6*
		1929 *1*	100 *8*	329.30	3/2$^+$	M1+E2	+0.42 *+6−10*	2.58×10^{-4} *5*	B(M1)(W.u.)=0.0073 *16*; B(E2)(W.u.)=0.9 *3* α(K)=2.54×10^{-5} *4*; α(L)=2.26×10^{-6} *4*; α(M)=2.90×10^{-7} *5*; α(N+..)=0.000230 *5* α(N)=1.578×10^{-8} *24*; α(IPF)=0.000230 *5*
2432.1	3/2 to 11/2	2394[s#t] *3*	25[s#] *13*	36.53	3/2$^-$				
		2394[s#t] *3*	25[s#] *13*	39.39	5/2$^-$				
		2432[#] *2*	100[#] *13*	0.0	7/2$^-$				
2474.58	11/2$^+$	592.5[j] *2*	33.6[jk] *5*	1881.76	9/2$^+$	M1+E2[c]	+0.09 *5*	2.69×10^{-4} *5*	B(M1)(W.u.)=0.068 *11*; B(E2)(W.u.)=4 *+5−4* α(K)=0.000244 *5*; α(L)=2.19×10^{-5} *4*; α(M)=2.80×10^{-6} *5*; α(N+..)=1.52×10^{-7} *3* α(N)=1.52×10^{-7} *3*
		1248.2[j] *2*	100.0[jk] *10*	1226.50	7/2$^+$	E2(+M3)[i]	≤0.00032	9.00×10^{-5} *13*	B(E2)(W.u.)=38 *6*; B(M3)(W.u.)≤17 *3* α(K)=6.57×10^{-5} *10*; α(L)=5.87×10^{-6} *9*; α(M)=7.51×10^{-7} *11*; α(N+..)=1.77×10^{-5} *3* α(N)=4.07×10^{-8} *6*; α(IPF)=1.77×10^{-5} *3*
2531.4	1/2,3/2,5/2$^{(+)}$	966 *1*	100	1565.4	1/2$^+$				
2656.66	13/2$^-$	1188.61[a] *20*	100.0[jk] *14*	1468.24	11/2$^-$	M1+E2[mn]	−2.6[l] *5*	8.61×10^{-5} *16*	α(K)=7.15×10^{-5} *13*; α(L)=6.39×10^{-6} *12*; α(M)=8.18×10^{-7} *15*; α(N+..)=7.31×10^{-6} *18* α(N)=4.44×10^{-8} *8*; α(IPF)=7.27×10^{-6} *18*
		1303.5[j] *3*	8.4[j] *4*	1353.49	9/2$^-$	(E2)[f]		9.55×10^{-5} *14*	α(K)=5.97×10^{-5} *9*; α(L)=5.34×10^{-6} *8*; α(M)=6.82×10^{-7} *10*; α(N+..)=2.97×10^{-5} *5* α(N)=3.71×10^{-8} *6*; α(IPF)=2.97×10^{-5} *5*

$^{45}_{22}Ti_{23}$-8

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[r]	Comments
2849.4	1/2,3/2,5/2$^{(+)}$	1284 *1*	100	1565.4	1/2$^+$				
2911.6	7/2$^+$	954 *1*	50 *20*	1958.2	3/2$^+$	(E2)[f]		0.0001360 *20*	B(E2)(W.u.)=48 *24* α(K)=0.0001235 *18*; α(L)=1.106×10^{-5} *16*; α(M)=1.414×10^{-6} *21* α(N+..)=7.65×10^{-8} *11* α(N)=7.65×10^{-8} *11*
		1030 *1*	67 *13*	1881.76	9/2$^+$	M1+E2		0.000100 *14*	α(K)=9.0×10^{-5} *12*; α(L)=8.1×10^{-6} *11*; α(M)=1.03×10^{-6} *14*; α(N+..)=5.6×10^{-8} *8* α(N)=5.6×10^{-8} *8* δ: +0.32 *+21−11* or >4.9.
		2167 *1*	100 *22*	743.88	5/2$^+$	M1+E2		0.00038 *4*	α(K)=2.14×10^{-5} *8*; α(L)=1.90×10^{-6} *7*; α(M)=2.43×10^{-7} *9*; α(N+..)=0.00036 *4* α(N)=1.33×10^{-8} *5*; α(IPF)=0.00036 *4* δ: +0.52 *+29−16* or +2.8 *10*.
2932.9	(13/2$^+$)	458[g]		2474.58	11/2$^+$				
3015.37	15/2$^-$	358.97[a] *15*	25.4[a] *19*	2656.66	13/2$^-$	M1+E2[mn]	−2.6[l] *3*	0.00242 *7*	α(K)=0.00220 *6*; α(L)=0.000199 *6*; α(M)=2.54×10^{-5} *7*; α(N+..)=1.35×10^{-6} *4* α(N)=1.35×10^{-6} *4* δ: value of −2.6 *3* results in E2 transition strength which greatly exceeds the RUL, with B(M1)(W.u.)=0.023 *8*; B(E2)(W.u.)=3.2×10^3 *9*.
		1546.90[a] *15*	100[a] *7*	1468.24	11/2$^-$	(E2)[fi]		1.52×10^{-4}	B(E2)(W.u.)=10 *3* α(K)=4.18×10^{-5} *6*; α(L)=3.73×10^{-6} *6*; α(M)=4.77×10^{-7} *7*; α(N+..)=0.0001064 *15* α(N)=2.59×10^{-8} *4*; α(IPF)=0.0001064 *15*
3156.0		2412 *1*	100	743.88	5/2$^+$				
3447.31	13/2$^+$	972.6[j] *2*	72.2[jo] *16*	2474.58	11/2$^+$	D,E2			
		1565.7[j] *2*	100.0[jo] *11*	1881.76	9/2$^+$	(E2)[fi]		0.0001590 *23*	B(E2)(W.u.)=20.4 *24* α(K)=4.08×10^{-5} *6*; α(L)=3.64×10^{-6} *5*; α(M)=4.65×10^{-7} *7*;

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Adopted Levels, Gammas (continued)

γ(^{45}Ti) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[r]	Comments
									B(E2)(W.u.)=20.4 *24* α(K)=4.08×10^{-5} *6*; α(L)=3.64×10^{-6} *5*; α(M)=4.65×10^{-7} *7*; α(N+..)=0.0001142 *16* α(N)=2.53×10^{-8} *4*; α(IPF)=0.0001142 *16*
3601.87	17/2$^-$	586.41[a] *15*	100[jo] *5*	3015.37	15/2$^-$	M1+E2[mn]	−2.3[l] *1*	4.85×10^{-4} *8*	α(K)=0.000440 *7*; α(L)=3.96×10^{-5} *7*; α(M)=5.06×10^{-6} *8*; α(N+..)=2.72×10^{-7} *5* α(N)=2.72×10^{-7} *5* δ: value of −2.3 *1* results in E2 transition strength which greatly exceeds the RUL, with B(M1)(W.u.)=0.0170 *22*; B(E2)(W.u.)=710 *80*.
		945.1[j] *2*	13.2[j] *3*	2656.66	13/2$^-$	E2[ip]		0.0001390 *20*	B(E2)(W.u.)=10.2 *10* α(K)=0.0001264 *18*; α(L)=1.132×10^{-5} *16*; α(M)=1.448×10^{-6} *21* α(N+..)=7.83×10^{-8} *11* α(N)=7.83×10^{-8} *11*
3922.45	15/2$^+$	475.2[j] *2*	20.3[jo] *6*	3447.31	13/2$^+$	(M1)[h]		1.66×10^{-4} *3*	B(M1)(W.u.)=0.111 *9* α(K)=0.000391 *6*; α(L)=3.51×10^{-5} *5*; α(M)=4.49×10^{-6} *7*; α(N+..)=2.43×10^{-7} *4* α(N)=2.43×10^{-7} *4*
		1447.8[j] *2*	100.0[jo] *6*	2474.58	11/2$^+$	(E2)[&fi]		1.22×10^{-4} *2*	B(E2)(W.u.)=24.9 *17* α(K)=4.78×10^{-5} *7*; α(L)=4.27×10^{-6} *6*; α(M)=5.46×10^{-7} *8*; α(N+..)=6.94×10^{-5} *10* α(N)=2.97×10^{-8} *5*; α(IPF)=6.94×10^{-5} *10*
3937.6	(11/2 to 15/2)	1463 *1*	100	2474.58	11/2$^+$				
4344.9	19/2$^-$	742.8[j] *2*	100.0[j] *13*	3601.87	17/2$^-$	M1[&m]		0.0001660 *24*	B(M1)(W.u.)=0.51 *7* α(K)=0.0001510 *22*; α(L)=1.351×10^{-5} *19*; α(M)=1.729×10^{-6} *25* α(N+..)=9.39×10^{-8} *14* α(N)=9.39×10^{-8} *14*
		1330.1[j] *3*	1.43[j] *13*	3015.37	15/2$^-$	(E2)[&f]		9.91×10^{-5} *14*	B(E2)(W.u.)=1.9 *4* α(K)=5.72×10^{-5} *8*; α(L)=5.11×10^{-6} *8*; α(M)=6.53×10^{-7} *10*;

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	α[r]	Comments
								B(E2)(W.u.)=1.9 *4* α(K)=5.72×10^{-5} *8*; α(L)=5.11×10^{-6} *8*; α(M)=6.53×10^{-7} *10*; α(N+..)=3.61×10^{-5} *6* α(N)=3.55×10^{-8} *5*; α(IPF)=3.61×10^{-5} *6*
4855.2	(17/2+)	933[g]	[g]	3922.45	15/2+	D,E2		
		1922[g]	[g]	2932.9	(13/2+)			
5239.9	(17/2+)	1317.5[j] *2*	53.6[j] *12*	3922.45	15/2+			
		1792.5[j] *2*	100.0[j] *14*	3447.31	13/2+	[E2]	2.49×10^{-4} *4*	B(E2)(W.u.)=3.E+1 *3* α(K)=3.13×10^{-5} *5*; α(L)=2.79×10^{-6} *4*; α(M)=3.57×10^{-7} *5*; α(N+..)=0.000214 *3* α(N)=1.94×10^{-8} *3*; α(IPF)=0.000214 *3*
5640.9	19/2+	401.3[j] *3*	14.0[jo] *6*	5239.9	(17/2+)	(M1)[&h]	6.29×10^{-4} *9*	B(M1)(W.u.)=0.22 *7* α(K)=0.000570 *8*; α(L)=5.13×10^{-5} *8*; α(M)=6.57×10^{-6} *10*; α(N+..)=3.55×10^{-7} *5* α(N)=3.55×10^{-7} *5*
		1717.7[j] *5*	100[jo] *2*	3922.45	15/2+	(E2)[&fi]	2.18×10^{-4} *3*	B(E2)(W.u.)=18 *6* α(K)=3.40×10^{-5} *5*; α(L)=3.03×10^{-6} *5*; α(M)=3.87×10^{-7} *6*; α(N+..)=0.000180 *3* α(N)=2.11×10^{-8} *3*; α(IPF)=0.000180 *3*
6006.7		2084[g]		3922.45	15/2+			
6163.0	23/2−	1818.0[jq] *4*	100[g]	4344.9	19/2−	E2[ip]	0.000260 *4*	B(E2)(W.u.)=8.6 *10* α(K)=3.05×10^{-5} *5*; α(L)=2.71×10^{-6} *4*; α(M)=3.47×10^{-7} *5*; α(N+..)=0.000226 *4* α(N)=1.89×10^{-8} *3*; α(IPF)=0.000226 *4*
6459.9	(21/2+)	453[g]		6006.7				
		819[g]		5640.9	19/2+			
6757.9	(21/2+)	1117[g]		5640.9	19/2+			
		1518[g]		5239.9	(17/2+)			
7143.4	27/2−	980.45[a] *25*	100[g]	6163.0	23/2−	E2[ip]	0.0001270 *18*	B(E2)(W.u.)=6.3 *9* α(K)=0.0001154 *17*; α(L)=1.033×10^{-5} *15*; α(M)=1.321×10^{-6} *19* α(N+..)=7.15×10^{-8} *10* α(N)=7.15×10^{-8} *10*
7342.0	(23/2+)	584[g]		6757.9	(21/2+)			
		1701[g]		5640.9	19/2+			
7830.7		1073[g]		6757.9	(21/2+)			
		2190[g]		5640.9	19/2+			
8289.2	(25/2+)	459[g]		7830.7				

$^{45}_{22}Ti_{23}$-11

Adopted Levels, Gammas (continued)

$\gamma(^{45}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]
8289.2	(25/2$^+$)	947[g]		7342.0	(23/2$^+$)	
		1829[g]		6459.9	(21/2$^+$)	
9643.5		2500[g]	100[g]	7143.4	27/2$^-$	D,E2[&]
10153.5	(25/2$^-$)	3010[g]	100[g]	7143.4	27/2$^-$	(D)[m]

E_i(level)	J^π_i	E_γ[†]	E_f	J^π_f	Mult.[‡]
10795.3	(29/2$^+$)	2506[g]	8289.2	(25/2$^+$)	
12498.6	(29/2$^-$)	2345[g]	10153.5	(25/2$^-$)	D,E2[&]
13030.4	(33/2$^+$)	2235[g]	10795.3	(29/2$^+$)	

† From (α,nγ), except as noted.

‡ From $\gamma(\theta)$ or nγ(Q) in (α,nγ) and comparison to RUL, except as noted.

From (p,nγ). 289.5γ deduced from Eγ(to 40)−3.3 *3*.

@ D,E2 or D,Q from comparison to RUL. $\Delta\pi$=yes from decay scheme.

& From comparison to RUL.

[a] From (HI,xnγ).

[b] D+Q or D(+Q) from $\gamma(\theta)$ or n$\gamma(\theta)$ in (α,nγ). $\Delta\pi$=yes from decay scheme.

[c] ΔJ=1 d+Q transition from DCO in (^{18}O,3nγ).

[d] Unweighted av of Iγ(483γ):Iγ(897γ):Iγ(1188γ):Iγ(1226γ)=13.6 *5*:15.1 *2*:2.0 *1*:0.81 *3* from (^{24}Mg,2pnγ), 47 *4*:36.9 *23*:10 *4*:6.4 *19* from (p,nγ), 40 *2*:42 *2*:8.5 *10*:9.5 *10* from (α,nγ), and 86 *11*:100 *9*:11.9 *21*:10.6 *21*.

[e] From $\gamma(\theta)$ and linear polarization in (α,nγ).

[f] D,E2 from comparison to RUL. ΔJ^π=2,no from decay scheme.

[g] From (^{18}O,3nγ).

[h] D from comparison to RUL. $\Delta\pi$=no from level scheme.

[i] ΔJ=0 d or ΔJ=2 Q transition from DCO in (^{18}O,3nγ).

[j] From (^{24}Mg,2pnγ).

[k] Branching ratios in (^{18}O,3nγ) and (α,nγ) are discrepant.

[l] From $\gamma(\theta)$ in (HI,xnγ).

[m] ΔJ=1 d transition from DCO in (^{18}O,3nγ).

[n] D+Q from $\gamma(\theta)$ in (HI,xnγ). Ne E1+M2 from δ and comparison to RUL.

[o] Branching ratios in (^{18}O,3nγ) are discrepant.

[p] Q from DCO in (^{18}O,3nγ). Ne M2 from comparison to RUL.

[q] From comparison of the Iγ's of the sequentially emitted γ's, 1818 and 743 keV, 1998Be29 in (^{18}O,3nγ) concluded that the previous ordering by 1978Fo09 in (HI,xnγ) should Be inverted. This conclusion is supported by the existence of the 1330γ crossover.

[r] 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.

[s] Multiply placed with undivided intensity.

[t] Placement of transition in the level scheme is uncertain.

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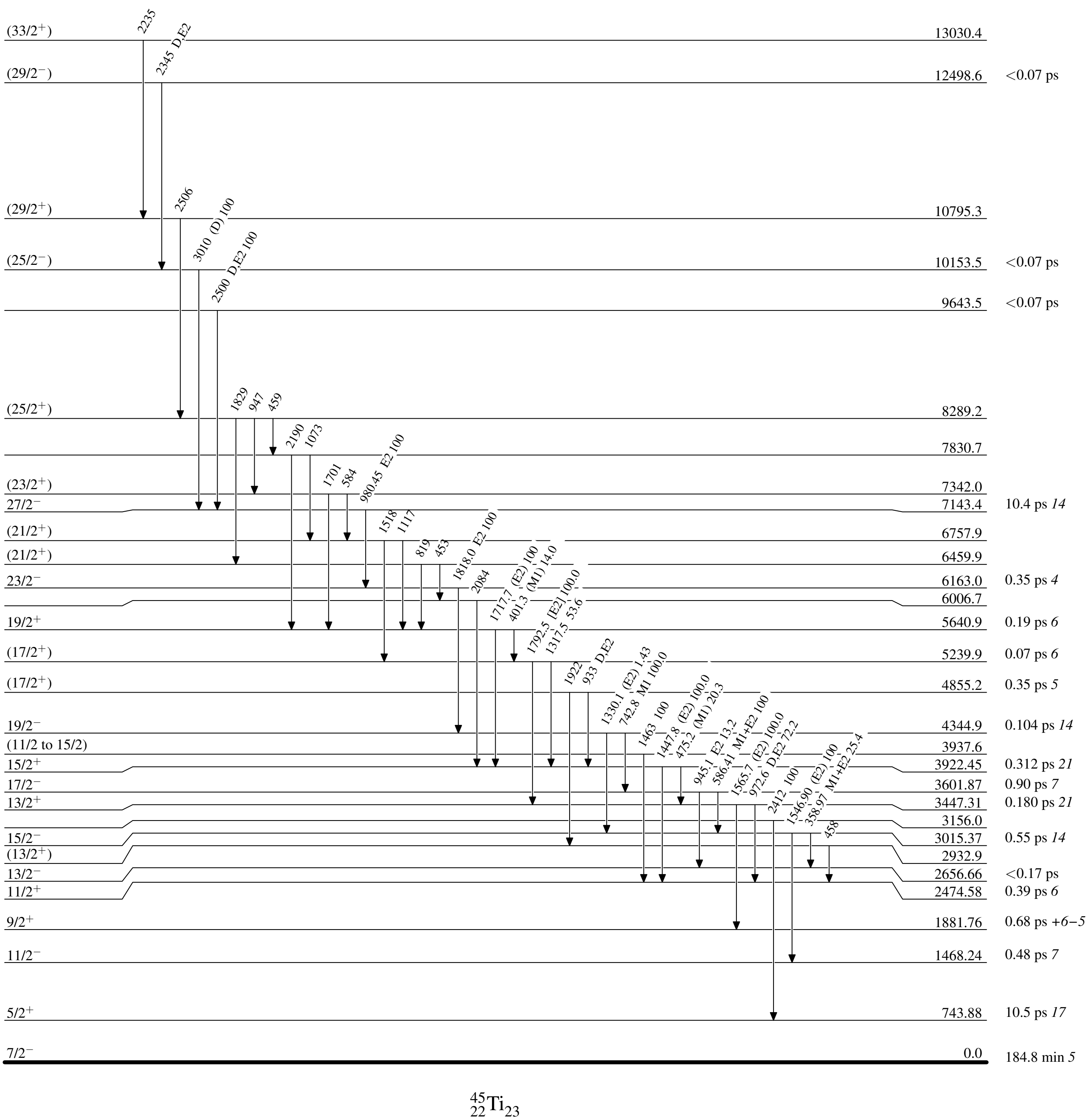
Adopted Levels, Gammas

Level Scheme

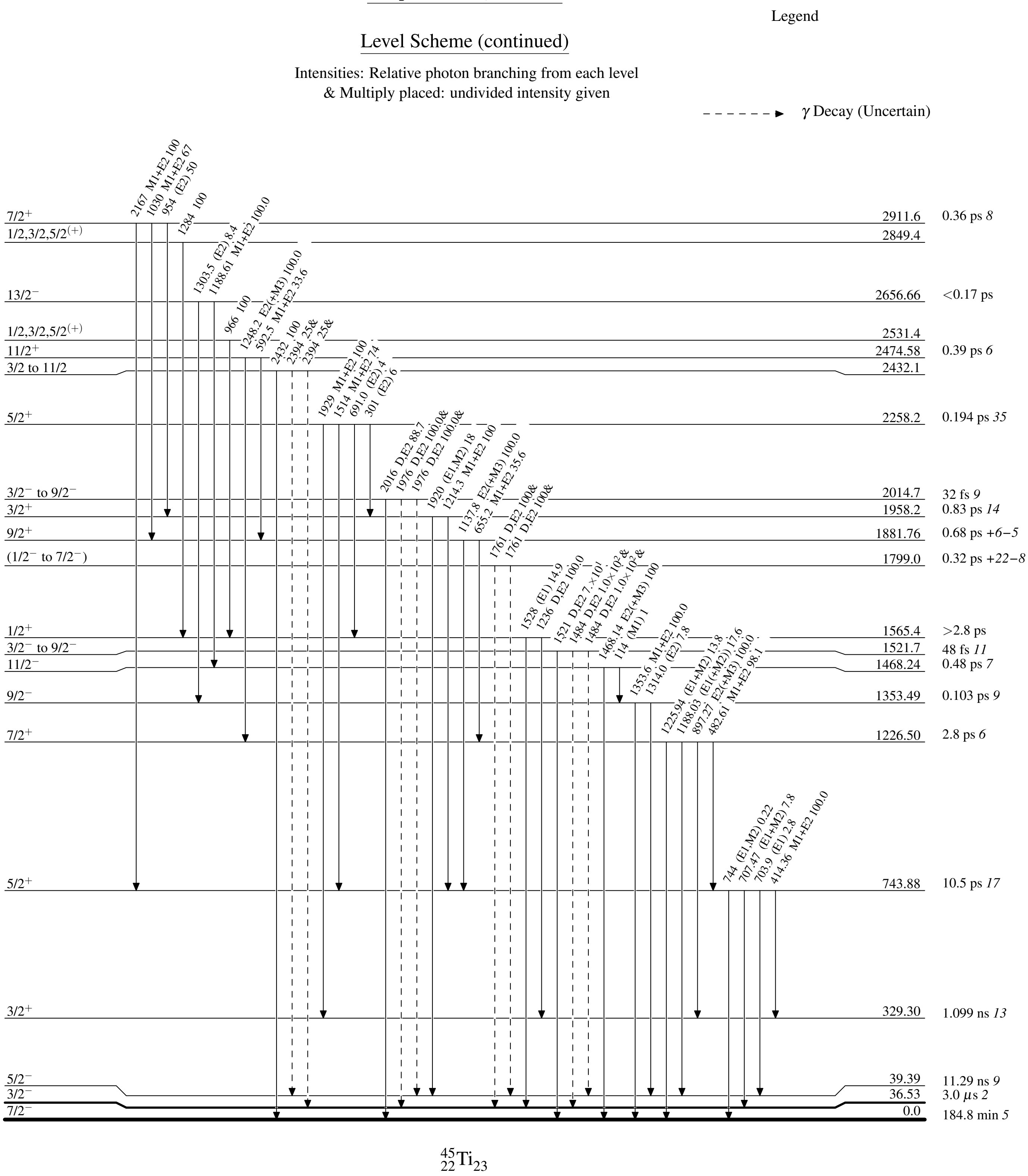
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

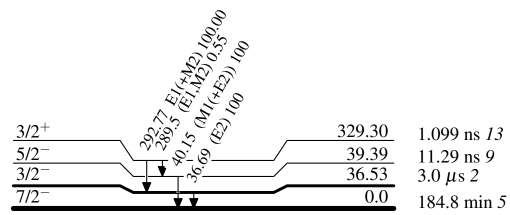
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

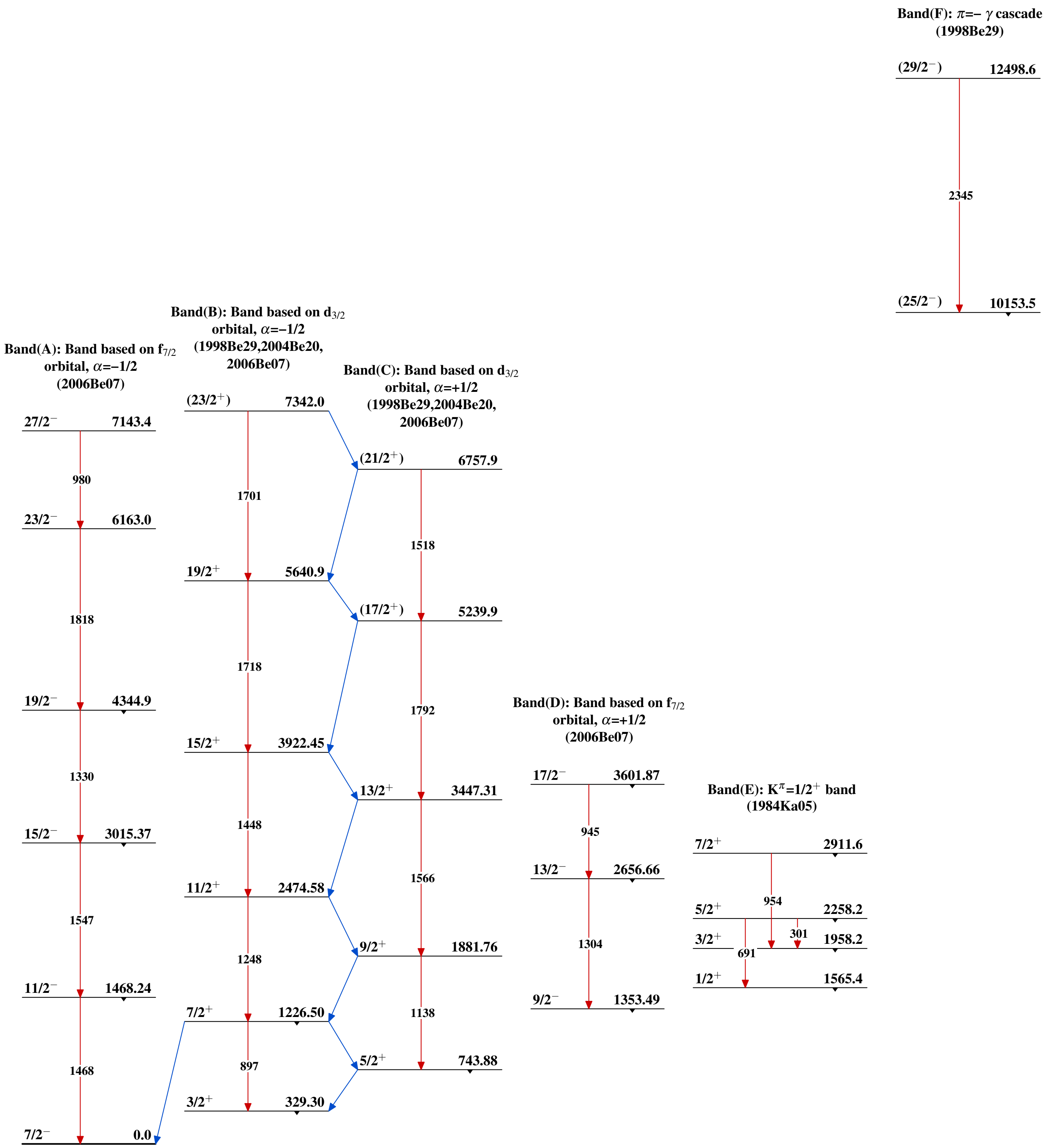
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{45}_{22}Ti_{23}$

Adopted Levels, Gammas



$^{45}_{22}Ti_{23}$