Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows[a]	NDS 109, 1879 (2008)	14-Jul-2008

$Q(\beta^-)=-601.9$ *9*; S(n)=8142.39 *3*; S(p)=11348 *5*; $Q(\alpha)=-10175.6$ *5* 2012Wa38
Note: Current evaluation has used the following Q record.
$Q(\beta^-)=-601.9$ *8*; S(n)=8142.39 *3*; S(p)=11352 *5*; $Q(\alpha)=-10171.8$ *9* 2003Au03

^{49}Ti Levels

Resonance parameters: see 2006MuZX and Ti(n,γ) E=0.00057 eV and ^{48}Ti(n,γ) E=11-52 keV resonance datasets for neutron parameters. See below for isobaric analog resonance data.

See 1978Ha15 for additional discussion, In particular on the correspondence of states observed In different reactions.

Bound-state T′s: from the study of IAS′s In ^{49}V. See ^{48}Ti(p,γ),(^{3}He,pd), ^{52}Cr(p,α) for correspondences between states.

Configurations: σ(θ) shows a predominant L=6 pattern and vector-analyzing power (VAP) has a clear J=7 signature In (d,α),(pol d,α) indicating a significant component of $(^{48}Ca\ 0^+)(\pi,1f_{7/2})^{+2}(\nu,1f_{7/2})^{-1}$.

E(F),J(γ) 2513, 2517 states: evaluator suggests that these states are a possible doublet based on conflicting γ information In (n,γ) and (p,p′γ). 1135γ′s were observed In both while a 2513γ and a 2517γ were noted In the respective works. Iγ(1135γ)/Iγ(2513γ)≈1 In (n,γ); Iγ(2517γ)/Iγ(1135γ)<20 In (p,p′γ). Further, arguments of 1983Ru08 In (n,γ) appear strong for placement of 1135γ from the 2721 state while pγ-coin In (p,p′γ) associate the 1135γ with a state At≈2.5 MeV. $J^\pi=5/2^-$ (empirical J-dependence of L=3 and VAP In (d,p)) May correspond to one or both of these states.

Cross Reference (XREF) Flags

A	^{49}Sc β^- decay	G	Ti(n,n′),(n,n′γ) E=1.0-5.9 MeV	M	^{49}Ti(p,p′),(p,p′γ) E=6-12 MeV
B	^{49}V ε decay	H	^{48}Ti(n,γ),(pol n,γ) E=th	N	Coulomb excitation (α,α′γ)
C	^{9}Be(^{46}Ar,^{6}nγ)	I	Ti(n,γ) E=0.00057 eV res	O	^{50}Ti(p,d),(d,t),(^{3}He,α)
D	^{47}Ti(t,p) E=12.0 MeV	J	^{48}Ti(n,γ) E=11-52 keV res	P	^{50}V(t,α) E=12.88 MeV
E	^{48}Ca(p,π^-),(pol p,π^-),	K	^{48}Ti(d,p),(d,pγ),(pol d,p)	Q	^{51}V(d,α),(pol d,α)
F	^{48}Ca(α,3nγ) E=30-55 MeV	L	^{49}Ti(γ,γ′),(γ,n)	R	^{49}Ti(e,e) E=175-325, 500 MeV

E(level)[†]	J^π[‡]	$T_{1/2}$[#]	XREF	Comments
0.0	$7/2^-$	stable	ABCDEFGH JKLMNOPQ	μ=−1.10417 *1* (2005St24,1965Dr03,1953Je16) Q=+0.247 *11* (2005St24,1999Bi11,1965Ch19) Configuration=$((48CA\ 0^+)(\pi\ 1f_{7/2})^{+2}(\nu\ 1f_{7/2})^{-1})$; T=5/2 J^π: J=7/2 from electron paramagnetic resonance and NMR (1976Fu06; 1962Wa03,1953Je16). π=− from L=3 In stripping and pickup. μ,Q: NMR (^{39}K standard) and AB (No pol correction. Reevaluated by 1999Bi11), respectively. Other Q: 0.324 *3* (1992Be68. LRSRD). See (e,e) for theoretical estimates of higher magnetic moments. Other: g-factor=0.24005 from comparison of theoretical and experimental NMR spectra for Ti metallic oxide (1986Eb02).
1381.773 *5*	$3/2^-$	3.4 ps *4*	GH JKLMNO Q	Octupole mom(mag)≤−0.8 *16*; MOME4≤−1.5 *14* (1994St27) T=5/2 J^π: L(d,p)=1 and Coul. ex. $T_{1/2}$: from B(E2)↓ In Coul. ex. other: 0.97 ps *+83−35* from Doppler broadening of γ′s In (n,γ). Octupole mom(mag),MOME4: ABLFS.
1542.15[@&] *4*	$11/2^-$	1.00 ps *10*	C FG KLMN PQ	J^π: 11/2 from γ(θ) In (α,3nγ). π=− from Coul. ex. to this state. $T_{1/2}$: from B(E2)↓ In Coul. ex.
1585.963 *6*	$3/2^-$[a]		D GH KLMNO	$T_{1/2}$>5.5 ps<7.6 ps; T=5/2

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Adopted Levels, Gammas (continued)

^{49}Ti Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
				$T_{1/2}$: lower limit from lack of Coul. ex.; upper limit from γ(t) In (d,pγ). Other: 1.3 ps +13−3 from Doppler broadening of γ′s In (n,γ).
1610? 10	(9/2⁻)		O	possible doublet. See discussion In (^{3}He,α). Jπ: from coupled-reaction-channel analysis assuming ((^{50}Ti 2⁺)(N $1f_{7/2}$)$^{-1}$). (^{3}He,^{3}He′α) and (^{3}He,α′α) considered.
1622.93[@&] 5	(5/2)⁻	37 fs 4	A D gH KLM PQ	Configuration=((48CA 0⁺)(π $1f_{7/2}$)$^{+2}$(ν $1f_{7/2}$)$^{-1}$); T=5/2 Jπ: 3/2⁻,5/2 to 9/2,11/2⁻ from D,E2 γ to 7/2⁻. 5/2⁻ to 19/2⁻ from L(t,α)=3. 3/2⁺,5/2 to 9/2,11/2⁺ from 8885 resonance primary G. Jp(^{49}V,8071)=(5/2). $T_{1/2}$: weighted av from (γ,γ′) and DSAM In (p,p′γ).
1723.482 6	1/2⁻[a]		D gH K M	$T_{1/2}$>0.35 ps<6.9 ns; T=5/2
1762.011 7	5/2⁻[b]	21.0 fs 19	A D GH KLM O Q	T=(5/2) $T_{1/2}$: weighted av (EXT.) of 20.1 fs 14 from Doppler broadening of γ′s In (n,γ) and 25 fs 3 from (γ,γ′). Other: 36 fs 8 from DSAM In (p,p′γ).
2261.32[@] 7	(5/2)⁻	59 fs 17	D gH KLM O Q	T=5/2 Jπ: L=3 In pickup reactions. Jπ(^{49}V,8633)=(5/2).
2471.4[@&] 2	(5/2)⁻	52 fs 17	D g KLM O Q	T=5/2 XREF: Q(2504). Jπ: L=3 In pickup reactions. Jπ(^{49}V,8785)=(5/2); Jπ(^{49}V,8789)=(5/2⁻).
2504.36 4	1/2⁺		GH KLM O	$T_{1/2}$>0.28 ps<6.9 ns; T=(5/2)
2505.5 3	15/2⁻		C F M PQ	$T_{1/2}$>3.5 ps<6.9 ns Jπ: 15/2 from γ(θ) In (α,3nγ). π=− from L(P)=3 In (t,α). $T_{1/2}$: lower limit from DSAM In (α,3nγ).
2513.44 15	5/2,7/2,9/2		d gH kl	Jπ: D γ from 7/2⁺, 8882.
2516? 4	5/2,7/2		d g klM	$T_{1/2}$>0.42 ps<6.9 ns Jπ: D γ from 7/2⁺. D,Q γ to 3/2⁻.
2664.36 4	(3/2)⁺		gH K M O Q	$T_{1/2}$>0.22 ps<6.9 ns; T=(5/2) Jπ: L(p,d)=2. Primary capture γ too strong to Be E2.
2720.6 10	(11/2⁺,13/2,15/2⁻)	57 fs 27	M pq	Jπ: 7/2⁻,9/2 to 13/2,15/2⁻ from D,E2 γ to 11/2⁻. Jπ>(11/2⁺) from lack of decay to states with Jπ<7/2⁻.
2721.30 6			H pq	2722, L=4, state In (d,α),(pol d,α) and 2724, L=(3), state In (t,α) May correspond to this or the previous state.
2980.5[@&] 3	(7/2⁻,9/2⁻)	0.13 ps 8	M Q	Configuration=((48CA 0⁺)(π $1f_{7/2}$)$^{+2}$(ν $1f_{7/2}$)$^{-1}$) Jπ: 7/2⁻ to 19/2⁻ from σ(θ) and VAP In (d,α),(pol d,α). ≤(9/2)⁻ from D,E2 γ to (5/2)⁻.
3038.68 9	(≤5/2⁻)		H k	Jπ: G to 1/2⁻.
3042.5[@&] 5	7/2⁻,9/2,11/2⁻	24 fs 15	k M Q	Configuration=((48CA 0⁺)(π $1f_{7/2}$)$^{+2}$(ν $1f_{7/2}$)$^{-1}$) Jπ: from D,E2 γ′s to 7/2⁻ and 11/2⁻.
3175.292 8	1/2⁻[a]	54.8 fs 18	D H K M OP	T=(5/2) $T_{1/2}$: from Doppler broadening of γ′s In (n,γ). Other: 76 fs +33−25 from DSAM In (d,pγ).
3260.703 7	3/2⁻[a]	11.2 fs 5	D H K M	T=5/2 $T_{1/2}$: from Doppler broadening of γ′s In (n,γ). Other: <10 fs from DSAM In (d,pγ).
3290.3 5	(17/2)⁻	<0.07 ps	C EF PQ	Configuration=((48CA 0⁺)(π $1f_{7/2}$)$^{+2}$(ν $1f_{7/2}$)$^{-1}$) Jπ: 7/2⁻ to 19/2⁻ from σ(θ) and VAP In (d,α),(pol

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Adopted Levels, Gammas (continued)

^{49}Ti Levels (continued)

E(level)[†]	J^π[‡]	$T_{1/2}$[#]	XREF	Comments
				d,α). 13/2 to 17/2 from $\gamma(\theta)$(785γ) In (α,3nγ). Lack of crossover transitions to J^π<15/2$^-$ suggests 17/2$^-$. $T_{1/2}$: from DSAM In (α,3nγ).
3428.25 *3*	3/2$^-$		D H KLM O	J^π: from comparison of VAP to empirical curves In (pol d,p) and γ-CP In (pol n,γ). Note that 1972Ba18 suggested that this state was a doublet; see (t,p) and (d,p) for discussion. This suggestion has not been confirmed.
3451? *7*	(7/2$^-$,9/2$^-$)		D M PQ	Configuration=((48CA 0$^+$)(π 1f$_{7/2}$)$^{+2}$(ν 1f$_{7/2}$)$^{-1}$) E(level): unweighted av from (t,p), (γ,γ'), and (d,α) assuming the same state is populated. J^π: 3/2$^+$,5/2 to 9/2,11/2$^+$ from D,E2 γ from 7/2$^+$. 7/2$^-$ to 19/2$^-$ from $\sigma(\theta)$ and VAP In (d,α). Correspondence of states not definite.
3469.02 *3*	1/2^{-c}		H K	
3511[d] *5*	5/2^{-b}		D KLM	
3606[&e] *3*	(5/2)$^+$		kLM O q	J^π: L(^{3}He,α)=2. 5/2,7/2,9/2 if primary γ In (γ,γ') is D.
3618.48 *13*	5/2^{-b}		D H k M q	
3639? *12*			K	
3700.7[e] *22*	(5/2,7/2,9/2)		KLM O	J^π: D,E2 γ from 7/2$^+$. γ to 7/2$^-$.
3746 *4*	5/2$^-$,7/2$^-$		klm O q	J^π: L(p,d)=3.
3747 *10*	+		klm Pq	J^π: L(t,α)=2. 3749 *12* In (d,p), 3749 *4*, 5/2 to 9/2$^+$ In(γ,γ'), and 3746.5 *6* In (p,p$'\gamma$) probably correspond to this or the following state.
3784.7[e] *22*	5/2$^-$,7/2^{-f}		d LM O	
3787.67 *6*	3/2$^-$	<16[g] fs	d H K	J^π: from comparison of VAP to empirical curves In (pol d,p) and γ-CP In (pol n,γ).
3818[@&] *10*			M P	
3854.98 *7*	5/2^{-b}		D H KLM O Q	T=5/2
3916? *10*			M	
3940.7[e] *22*	(5/2,7/2,9/2)		D LM	J^π: 3/2$^+$,5/2,7/2,9/2,11/2$^+$ from D,E2 γ from 7/2$^+$. γ to 7/2$^-$.
3967 *5*	$-$		E Q	Configuration=((48CA 0$^+$)(π 1f$_{7/2}$)$^{+2}$(ν 1f$_{7/2}$)$^{-1}$) E(level): from (d,α). J^π: 7/2$^-$ to 19/2$^-$ from $\sigma(\theta)$ and VAP In (d,A),(pol d,α). Note: J^π=15/2$^-$ from comparison of (1f$_{7/2}$)^n, zero-order plane-wave approximation, calculations to $\sigma(\theta)$ In (p,π^-).
3990?[@] *10*			D M	
4074.16 *22*	5/2$^-$,7/2^{-f}		D H KLM O Q	
4142[e] *4*	(5/2$^-$)[b]		D KLM	
4195 *12*	5/2$^-$,7/2^{-f}		K m O	
4221.802 *23*	1/2^{-a}	<22[g] fs	H K m	
4242[e] *4*	7/2$^-$		L O Q	Configuration=((48CA 0$^+$)(π 1f$_{7/2}$)$^{+2}$(ν 1f$_{7/2}$)$^{-1}$) J^π: L(p,d)=3 and J=7/2 from 8885 primary $\gamma(\theta)$.
4300 *15*	$-$		D o	J^π: L(t,p)=2 for both these states. 4331, L(p,d)=3, May Be a different state or correspond to one or both of these states.
4340[d] *15*	$-$		D K o	see comment on preceding state.
4382.3 *7*	(19/2)$^-$	<0.12 ps	EF Q	J^π: $\gamma(\theta)$(1092γ) In (α,3nγ) gives ΔJ<1 to (17/2)$^-$. π=$-$ from L(d,α)=6. Lack of crossover transitions implies J^π=(19/2)$^-$. $T_{1/2}$: from DSAM In (α,3nγ).
4433.26 *4*	3/2^{-a}		H K	
4456 *12*	1/2$^+$		K O	
4489 *15*	$-$		D	J^π: L(t,p)=2.
4506.9 *10*	5/2^{+a}		KL	T=5/2 E(level): from (d,pγ).

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Adopted Levels, Gammas (continued)

^{49}Ti Levels (continued)

E(level)†	Jπ‡	T1/2#	XREF	Comments
4561 *10*	1/2+ [f]		O	
4584 *10*	+		P	Jπ: L(t,α)=2.
4588.24 *4*	3/2− [c]		H K Q	
4621 *20*			P	
4666.666 *21*	1/2− [a]		H K	
4725 *10*			P	
4770 *12*	3/2+,5/2+ [a]		K O	T=(5/2) Jπ: L(^{3}He,α)=2. 9/2+ from comparison of VAP to DWBA In (pol d,p) discrepant. However, 1972Ko41 assumed L(d,p)=4 from 1967Ba32 who noted that the DWBA fit to σ(θ) was poor At forward angles and justified L(d,p)=4 from systematics In the region.
4811.01 *10*			H	
4836 *12*			K	
4897 *12*	3/2+,5/2+		K o	
4910.84 *5*	1/2− [c]		D H K o	
5063 *12*	(5/2−) [b]		D K	
5115.562 *21*	1/2− [a]	<10 [g] fs	H K	
5121 *10*	11/2+,13/2+		PQ	E(level): from (t,α). Jπ: L(t,α)=0.
5151.11 *10*	(3/2)		H	Jπ: ≠ 1/2 from γ-CP In (pol n,γ); primary γ too strong to Be Q.
5173 *12*	5/2−,7/2−		D K P	
5200 *15*	+		D	Jπ: L(t,p)=1.
5232 *15*	3/2−,1/2−		D K	
5254.5 *25*	1/2+		K	
5325.8 *13*	5/2+,3/2+		K	
5347 *15*	(5/2−) [b]		D	
5375? *12*			K	
5412.03 *9*	1/2+	19 [g] fs *+12−10*	H K	
5437 *12*	3/2−,1/2−		K	
5579 *12*			K	
5606? *10*			Q	
5655 *12*	(3/2,1/2)−		D K	Jπ: π=− from L(t,p)=2. (3/2−,1/2−) from L(d,p)=(1).
5693 *12*	5/2+,3/2+		K	
5737.9 *12*	3/2−,1/2−		K	
5774 *15*	1/2+		K	
5795.67 *13*	(3/2−,1/2−)		H K	
5861 *15*	5/2− [b]		D K	
5910 *15*	−		D	Jπ: L(t,p)=2.
5931 *12*	1/2+		K	
5965 *12*	(5/2)−		D K	Jπ: empirical J-dependence of L(d,p)=3 transitions.
6010 *12*	5/2− [b]		D K	
6012 *15*	3/2+,5/2+		O	Jπ: L(p,d)=2.
6078 *12*	1/2+		K	
6091? *15*			K	
6125? *10*			Q	
6145 *12*			K	
6168 *12*			K	
6231? *10*			Q	
6269? *10*			Q	
6279 *15*	(5/2−) [b]		D	
6513 *10*			Q	
7329 *15*	3/2+,5/2+ [f]		O	

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Adopted Levels, Gammas (continued)

^{49}Ti Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	XREF	Comments
7626 *15*	$3/2^+,5/2^+$[f]		O	
8132.605 *29*	$1/2^+$		I	Γ_γ=35.8 eV *18* E(level),J^π,Γ_γ: from fit to total σ(n,γ) In (n,γ) E=0.00057 eV by multilevel formalism.
8153.65 *3*	$1/2^-,3/2^-$[h]		J	
8155.54 *3*	$1/2^-,3/2^-$[h]		J	
8159.63 *4*	$1/2^+$[h]		J	
8163.56 *5*	$1/2^-,3/2^-$[h]		J	
8178.44 *4*	$1/2^+$[h]		J	
8193.23 *11*	$1/2^+$[h]		J	
8724 *6*	$5/2^-,7/2^-$[f]		O	T=7/2 analog of ^{49}Sc g.s..
8881.6 *9*	$7/2^+$	2.29 eV *43*	L	%g=89.1 *28*; %n=10.9 *28* Γ_γ=2.04 eV *42*; Γ_n=0.25 eV *5*; $\Gamma_{\gamma 0}$=0.353 eV *31* J^π: J=7/2 from 8884$\gamma(\theta)$; π=+ from E1 γ to $7/2^-$. σ_n(THETA) consistent with theory for 7/2−(E1)7/2+(L=4)0^+, confirming assignment. Γ_γ,Γ_n,$\Gamma_{\gamma 0}$: from (γ,γ'),(γ,n). %γ,%n: from Γ_n and Γ_γ. 726, L=4, neutron group to ^{48}Ti g.s..
8890	$3/2^+,5/2^+$[f]		O	
9720?			L	weak 582-keV neutron group to ^{48}Ti 983 state observed In (γ,n).
10972 *15*	$(1/2^+)$[f]		O	T=(7/2) IAS(^{49}Sc 2230).
11110 *15*	$(3/2^+,5/2^+)$[f]		O	T=(7/2) IAS(^{49}Sc 2380).
11700	$(1/2^-,3/2^-)$[f]		O	T=(7/2) IAS?

[†] Except As noted, energies of states connected by Γ's were calculated using least-squares adjustment procedures; statistical uncertainties are given; systematic uncertainty=3.2×10^{-4}% from (n,γ). Note that primary γ's were included In the procedure and γ's with No uncertainties were excluded. Other energies from (d,p), except As noted In comments, footnotes, or the XREF column.

[‡] From angular momentum transfer In (d,p), except As noted.

[#] $T_{1/2}$'s from DSAM In (p,p$'\gamma$), except As noted; $T_{1/2}$<6.9 ns from lack of delayed γ's In (p,p$'\gamma$) coincidences. Γ from (γ,γ'),(γ,n).

[@] From (p,p$'$),(p,p$'\gamma$).

[&] Level energy held fixed In least-squares adjustment.

[a] From comparison of VAP to DWBA In (pol d,p).

[b] L(t,p)=0 or 0+2. Parenthesized values are shown for weak states where the assumption that the two nucleons are transferred In a relative S state May not Be valid.

[c] From angular momentum transfer In (d,p) and γ-circular polarization In (pol n,γ).

[d] From (t,p).

[e] From (γ,γ'),(γ,n).

[f] From angular momentum transfer In neutron pickup reactions.

[g] From DSAM In (d,pγ).

[h] From adopted J and L In 2006MuZX.

Adopted Levels, Gammas (continued)

$\gamma(^{49}Ti)$

For unplaced γ's and γ's with uncertain placement see (n,γ), (γ,γ'), (p,p$'\gamma$), and (n,n$'\gamma$).
B(Eλ)(W.u.),B(Mλ)(W.u.),RUL: calculations for primary gammas are based on $\Gamma_{\gamma 0}$ and Iγ/Iγ(8884γ).

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[†]	E_f	J^{π}_f	Mult.	δ	α[i]	Comments
1381.773	3/2$^-$	1381.745[‡] *5*	100	0.0	7/2$^-$	(E2)		0.0001070 *15*	B(E2)(W.u.)=3.1 *4* α=0.0001070 *15*; α(K)=5.27×10^{-5} *8*; α(L)=4.71×10^{-6} *7*; α(M)=6.02×10^{-7} *9* α(N+..)=4.95×10^{-5} *7* α(N)=3.27×10^{-8} *5*; α(IPF)=4.94×10^{-5} *7* Mult.: D,E2 from comparison to RUL, ΔJ^{π}=2,Nofrom level scheme.
1542.15	11/2$^-$	1542.5[#] *3*	100[#]	0.0	7/2$^-$	E2		0.0001510 *22*	B(E2)(W.u.)=6.1 *6* α=0.0001510 *22*; α(K)=4.20×10^{-5} *6*; α(L)=3.75×10^{-6} *6*; α(M)=4.79×10^{-7} *7* α(N+..)=0.0001046 *15* α(N)=2.61×10^{-8} *4*; α(IPF)=0.0001046 *15* Mult.: ΔJ=2 Q In (α,3nγ). Comparison to RUL excludes M2.
1585.963	3/2$^-$	1585.942[‡] *6*	100	0.0	7/2$^-$	(E2)		0.0001660 *24*	B(E2)(W.u.)>0.697<0.963 α=0.0001660 *24*; α(K)=3.97×10^{-5} *6*; α(L)=3.54×10^{-6} *5*; α(M)=4.53×10^{-7} *7* α(N+..)=0.0001227 *18* α(N)=2.46×10^{-8} *4*; α(IPF)=0.0001227 *18* Mult.: D,E2 from comparison to RUL. ΔJ^{π}=2,Nofrom level scheme.
1622.93	(5/2)$^-$	1622.6 *6*	100	0.0	7/2$^-$	D,E2[@]			E_{γ},I_{γ}: from β^- decay.
1723.482	1/2$^-$	137.42 *7*	2.18 *12*	1585.963	3/2$^-$	(M1,E2)[@]		0.00848 *0.101*	$\alpha\geq$0.00848$\leq$0.101 α(K)=0.05 *5*; α(L)=0.005 *4*; α(M)=0.0006 *5*; α(N+..)=2.9×10^{-5} *25* α(N)=2.9×10^{-5} *25* Mult.: D,E2 from comparison to RUL. $\Delta\pi$=No from level scheme.
		341.706[‡] *4*	100.0 *9*	1381.773	3/2$^-$	M1+E2	+0.1	0.000929 *14*	B(M1)(W.u.)<1.52>7.74×10^{-5}; B(E2)(W.u.)<316>0.0160 α=0.000929 *14*; α(K)=0.000843 *12*; α(L)=7.61×10^{-5} *11*; α(M)=9.73×10^{-6} *14* α(N+..)=5.25×10^{-7} *8* α(N)=5.25×10^{-7} *8* Mult.,δ: from α(exp) and $\gamma\gamma(\theta)$ In (n,γ).
1762.011	5/2$^-$	1761.971[‡] *8*	100	0.0	7/2$^-$	(M1+E2)		2.11×10^{-4} *25*	α=2.11×10^{-4} *25*; α(K)=3.08×10^{-5} *16*;

$^{49}_{22}Ti_{27}$-6

Adopted Levels, Gammas (continued)

$\gamma(^{49}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	α[i]	Comments
								$\alpha(L)=2.75\times10^{-6}$ *14*; $\alpha(M)=3.51\times10^{-7}$ *18* $\alpha(N+..)=0.000177$ *23* $\alpha(N)=1.91\times10^{-8}$ *10*; $\alpha(IPF)=0.000177$ *23* Mult.,δ: from $\gamma(\theta)$ In (γ,γ'). $\Delta\pi$=No from level scheme. $+0.1<\delta<+0.4$ or -0.3.
2261.32	(5/2)$^-$	499.2[a]	35[a]	1762.011	5/2$^-$	(M1(+E2))[&]	0.00063 *25*	$\delta<0.26$ *4*; B(M1)(W.u.)=0.49 *15* $\alpha=0.00063$ *25*; $\alpha(K)=0.00057$ *22*; $\alpha(L)=5.1\times10^{-5}$ *20*; $\alpha(M)$=7.E−6 *3* $\alpha(N+..)=3.5\times10^{-7}$ *14* $\alpha(N)=3.5\times10^{-7}$ *14*
		638.41 *7*	100[a]	1622.93	(5/2)$^-$	(M1(+E2))[&]	0.00032 *9*	$\delta<0.28$ *5*; B(M1)(W.u.)=0.55 *25* $\alpha=0.00032$ *9*; $\alpha(K)=0.00029$ *9*; $\alpha(L)=2.6\times10^{-5}$ *8*; $\alpha(M)=3.3\times10^{-6}$ *10* $\alpha(N+..)=1.8\times10^{-7}$ *5* $\alpha(N)=1.8\times10^{-7}$ *5*
		879.16[j] *17*		1381.773	3/2$^-$			I_γ: weak.
		2264[b] *3*	73	0.0	7/2$^-$	D,E2[@]		
2471.4	(5/2)$^-$	709.1[a]	45[a]	1762.011	5/2$^-$	(M1(+E2))[&]	0.00024 *6*	$\delta<0.58$ *13*; B(M1)(W.u.)=0.21 *10* $\alpha=0.00024$ *6*; $\alpha(K)=0.00022$ *6*; $\alpha(L)=2.0\times10^{-5}$ *5*; $\alpha(M)=2.5\times10^{-6}$ *7* $\alpha(N+..)=1.4\times10^{-7}$ *4* $\alpha(N)=1.4\times10^{-7}$ *4*
		848.3[a]	100[a]	1622.93	(5/2)$^-$	(M1(+E2))[&]	0.00016 *3*	$\delta<0.61$ *15*; B(M1)(W.u.)=0.27 *13* $\alpha=0.00016$ *3*; $\alpha(K)=0.00014$ *3*; $\alpha(L)=1.26\times10^{-5}$ *24*; $\alpha(M)=1.6\times10^{-6}$ *3* $\alpha(N+..)=8.7\times10^{-8}$ *16* $\alpha(N)=8.7\times10^{-8}$ *16*
		2474[b] *3*	68[a]	0.0	7/2$^-$	D,E2[@]		
2504.36	1/2$^+$	889.1[j] *5*	18					
		1122.69 *8*	100 *4*	1381.773	3/2$^-$			
2505.5	15/2$^-$	963.3[#] *3*	100[#]	1542.15	11/2$^-$	(E2(+M3))	0.00030 *17*	B(E2)(W.u.)<18.3>0.0093; B(M3)(W.u.)>0.40 $\alpha=0.00030$ *17*; $\alpha(K)=0.00027$ *16*; $\alpha(L)=2.5\times10^{-5}$ *14*; $\alpha(M)=3.2\times10^{-6}$ *18* $\alpha(N+..)=1.7\times10^{-7}$ *10* $\alpha(N)=1.7\times10^{-7}$ *10* Mult.: Q from $\gamma(\theta)$ In $(\alpha,3n\gamma)$. $\Delta\pi$=No from level scheme.
2513.44	5/2,7/2,9/2	2513.30 *15*	100	0.0	7/2$^-$			
2516?	5/2,7/2	1139[b][j] *3*	>100[a]	1381.773	3/2$^-$	D,Q[@]		
		2520[b][j] *3*	<20[a]	0.0	7/2$^-$			
2664.36	(3/2)$^+$	902.38 *5*		1762.011	5/2$^-$			

$^{49}_{22}Ti_{27}$-7

$\gamma(^{49}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	α[i]	Comments
2664.36	$(3/2)^+$	1282.4[aj]		1381.773	$3/2^-$			
2720.6	$(11/2^+,13/2,15/2^-)$	1178.4[a]	100[a]	1542.15	$11/2^-$	D,E2[@]		
2721.30		1135.35 *6*	100 *5*	1585.963	$3/2^-$			
2980.5	$(7/2^-,9/2^-)$	260[aj]	<25[a]	2720.6	$(11/2^+,13/2,15/2^-)$			
		1357.6[a]	100[a]	1622.93	$(5/2)^-$	D,E2[@]		
3038.68	$(\le5/2^-)$	1315.6 *3*	100	1723.482	$1/2^-$			
3042.5	$7/2^-,9/2,11/2^-$	1419.5[a]	100[a]	1622.93	$(5/2)^-$	D,E2[@]		
		1500.2[a]	62[a]	1542.15	$11/2^-$	D,E2[@]		
		3042.5[a]	88[a]	0.0	$7/2^-$	D,E2[@]		
3175.292	$1/2^-$	1451.79 *4*	9.4 *3*	1723.482	$1/2^-$	(M1)	9.72×10^{-5} *14*	$\alpha=9.72\times10^{-5}$ *14*; $\alpha(K)=4.13\times10^{-5}$ *6*; $\alpha(L)=3.68\times10^{-6}$ *6*; $\alpha(M)=4.71\times10^{-7}$ *7*; $\alpha(N+..)=5.17\times10^{-5}$ *8* $\alpha(N)=2.57\times10^{-8}$ *4*; $\alpha(IPF)=5.17\times10^{-5}$ *8* B(M1)(W.u.)=0.0083 *5* Mult.: D,E2 from comparison to RUL. $\ne$ E2 since $1/2-\rightarrow1/2^-$ transition; $\Delta\pi$=No from level scheme.
		1589.348[‡] *19*	39.3 *12*	1585.963	$3/2^-$	D,E2[@]		
		1793.478[‡] *7*	100 *3*	1381.773	$3/2^-$	D,E2[@]		
3260.703	$3/2^-$	1498.662[‡] *7*	100.0 *27*	1762.011	$5/2^-$	(M1(+E2))[&]	1.22×10^{-4} *15*	$\delta<1.20$ *11*; B(M1)(W.u.)=0.34 *15* $\alpha=1.22\times10^{-4}$ *15*; $\alpha(K)=4.2\times10^{-5}$ *3*; $\alpha(L)=3.7\times10^{-6}$ *3*; $\alpha(M)=4.8\times10^{-7}$ *4* $\alpha(N+..)=7.6\times10^{-5}$ *12* $\alpha(N)=2.59\times10^{-8}$ *18*; $\alpha(IPF)=7.6\times10^{-5}$ *12*
		1674.734[‡] *22*	8.12 *25*	1585.963	$3/2^-$	D,E2[@]		
		1878.891 *10*	≈10	1381.773	$3/2^-$	D,E2[@]		
3290.3	$(17/2)^-$	784.8[#] *3*	100[#]	2505.5	$15/2^-$	D+Q		$\delta\ge-0.10\le+0.04$ Mult.,δ: from $\gamma(\theta)$ In $(\alpha,3n\gamma)$.
3428.25	$3/2^-$	1665.96 *17*	15.5 *16*	1762.011	$5/2^-$			
		1842.24 *4*	100 *13*	1585.963	$3/2^-$			
		2046.44 *5*	84 *8*	1381.773	$3/2^-$			
3469.02	$1/2^-$	1883.06 *4*	100	1585.963	$3/2^-$			
3618.48	$5/2^-$	149.56 *15*	100	3469.02	$1/2^-$	[E2]	0.0712	$\alpha(K)=0.0644$ *10*; $\alpha(L)=0.00599$ *9*; $\alpha(M)=0.000759$ *11*; $\alpha(N+..)=3.85\times10^{-5}$ *6* $\alpha(N)=3.85\times10^{-5}$ *6*
3700.7	$(5/2,7/2,9/2)$	3702[b] *3*		0.0	$7/2^-$			
3784.7	$5/2^-,7/2^-$	3786[b] *3*		0.0	$7/2^-$			

From ENSDF

$^{49}_{22}Ti_{27}$-8

$\gamma(^{49}Ti)$ (continued)

E_i(level)	J^π_i	E_γ [†]	I_γ [†]	E_f	J^π_f	Mult.	α [i]	Comments
3787.67	3/2⁻	2025 [cj]		1762.011	5/2⁻			
		2201 [c]		1585.963	3/2⁻			
		2405.76 *8*		1381.773	3/2⁻			
3854.98	5/2⁻	1350.46 *14*	86 *8*	2504.36	1/2⁺			
		2132.0 *3*	43 *21*	1723.482	1/2⁻			
		2473.03 *22*	100 *14*	1381.773	3/2⁻			
3940.7	(5/2,7/2,9/2)	3942 [b] *3*		0.0	7/2⁻			
4074.16	5/2⁻,7/2⁻	605.2 *3*	100	3469.02	1/2⁻			
4221.802	1/2⁻	434.09 *16*	5.2 *8*	3787.67	3/2⁻	(M1(+E2)) [&]	0.0010 *5*	δ<0.2618 *7*; B(M1)(W.u.)=0.336 *12* α=0.0010 *5*; α(K)=0.0009 *4*; α(L)=8.E−5 *4*; α(M)=1.0×10^{-5} *5* α(N+..)=5.3×10^{-7} *24* α(N)=5.3×10^{-7} *24*
		2498.24 [d] *7*	47.5 *27*	1723.482	1/2⁻	(M1)	0.000481 *7*	α=0.000481 *7*; α(K)=1.635×10^{-5} *23*; α(L)=1.455×10^{-6} *21*; α(M)=1.86×10^{-7} *3* α(N+..)=0.000463 *7* α(N)=1.015×10^{-8} *15*; α(IPF)=0.000463 *7* B(M1)(W.u.)>0.018 Mult.: D,E2 from comparison to RUL. ≠ E2 since 1/2−→1/2⁻ transition; $\Delta\pi$=No from level scheme.
		2635.5 *3*	20 *3*	1585.963	3/2⁻	D,E2 [@]		
		2839.88 [d] *4*	100 *4*	1381.773	3/2⁻	D,E2 [@]		
4382.3	(19/2)⁻	1092.0 [#] *5*	100 [#]	3290.3	(17/2)⁻	D+Q		δ≥+0.03≤+0.12 Mult.,δ: from $\gamma(\theta)$ In (α,3nγ).
4433.26	3/2⁻	2709.63 *12*	100 *9*	1723.482	1/2⁻			
		2847.39 *15*	83 *7*	1585.963	3/2⁻			
4506.9	5/2⁺	3125 [c]		1381.773	3/2⁻			
4588.24	3/2⁻	1327.74 [j] *8*	100 *4*	3260.703	3/2⁻			
		1549.56 *8*	45.3 *24*	3038.68	(≤5/2⁻)			
		3002.11 [d] *9*	94 *5*	1585.963	3/2⁻			
		3205.96 *17*	33.9 *28*	1381.773	3/2⁻			
4666.666	1/2⁻	1406.36 *16*	5.8 *6*	3260.703	3/2⁻			
		2943.00 *3*	100 *3*	1723.482	1/2⁻			
		3284.85 *13*	11.8 *9*	1381.773	3/2⁻			
4811.01		2307.3 *4*	28 *5*	2504.36	1/2⁺			
		3224.89 *11*	100 *6*	1585.963	3/2⁻			
4910.84	1/2⁻	3186.91 [e] *10*	100 *7*	1723.482	1/2⁻			
		3325.10 *25*	46 *5*	1585.963	3/2⁻			
5115.562	1/2⁻	1646.46 *21*	3.5 *4*	3469.02	1/2⁻	(M1)	1.49×10^{-4} *21*	B(M1)(W.u.)>0.011 α=1.49×10^{-4} *21*; α(K)=3.30×10^{-5} *5*; α(L)=2.94×10^{-6} *5*; α(M)=3.76×10^{-7} *6*;

From ENSDF

$^{49}_{22}Ti_{27}$-9

$\gamma(^{49}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	α[i]	Comments
								α(N+..)=0.0001128 *16* α(N)=2.05×10^{-8} *13*; α(IPF)=0.0001128 *16* Mult.: D,E2 from comparison to RUL. ≠ E2 since 1/2−→1/2$^-$ transition; $\Delta\pi$=No from level scheme.
5115.562	1/2$^-$	1853.7 *5*	5.0 *15*	3260.703	3/2$^-$	D,E2[@]		
		1940.14[j] *19*	13.7 *23*	3175.292	1/2$^-$	(M1)	0.000253 *4*	α=0.000253 *4*; α(K)=2.48×10^{-5} *4*; α(L)=2.21×10^{-6} *3*; α(M)=2.83×10^{-7} *4* α(N+..)=0.000225 *4* α(N)=1.543×10^{-8} *22*; α(IPF)=0.000225 *4* B(M1)(W.u.)>0.026 Mult.: D,E2 from comparison to RUL. ≠ E2 since 1/2−→1/2$^-$ transition; $\Delta\pi$=No from level scheme.
		2600.9 *6*	2.1 *6*	2513.44	5/2,7/2,9/2			
		2611.04 *8*	19.1 *11*	2504.36	1/2$^+$	D,E2[@]		
		3529.31[j] *10*	12.8 *6*	1585.963	3/2$^-$	D,E2[@]		
		3733.61[d] *3*	100.0 *23*	1381.773	3/2$^-$	D,E2[@]		
5151.11	(3/2)	1077.0 *3*	53 *10*	4074.16	5/2$^-$,7/2$^-$			
		1532.79 *21*	67 *8*	3618.48	5/2$^-$			
		2430.9 *4*	44 *12*	2721.30				
		3388.0 *7*	25 *8*	1762.011	5/2$^-$			
		3427.7[j] *5*	44 *9*	1723.482	1/2$^-$			
		3564.71 *17*	100 *9*	1585.963	3/2$^-$			
5412.03	1/2$^+$	4030.06 *16*	100	1381.773	3/2$^-$	(E1(+M2))[f]	0.0013 *5*	δ<0.10 *4*; B(E1)(W.u.)=0.0004 *3* α=0.0013 *5*; α(K)=8.4×10^{-6} *25*; α(L)=7.5×10^{-7} *23*; α(M)=1.0×10^{-7} *3* α(N+..)=0.0012 *5* α(N)=5.2×10^{-9} *16*; α(IPF)=0.0012 *5*
5795.67	(3/2$^-$,1/2$^-$)	3534.37 *17*	100 *12*	2261.32	(5/2)$^-$			
		4071.7 *4*	52 *8*	1723.482	1/2$^-$			
8153.65	1/2$^-$,3/2$^-$	6772[g]		1381.773	3/2$^-$			
8155.54	1/2$^-$,3/2$^-$	6774[g]		1381.773	3/2$^-$			
8159.63	1/2$^+$	6778[g]		1381.773	3/2$^-$			
8163.56	1/2$^-$,3/2$^-$	6782[g]		1381.773	3/2$^-$			
8178.44	1/2$^+$	6797[g]		1381.773	3/2$^-$			
8193.23	1/2$^+$	6812[g]		1381.773	3/2$^-$			
8881.6	7/2$^+$	4374[b] *3*	4.0[b] *8*	4506.9	5/2$^+$	D,E2[@]		
		4639[b] *3*	9.0[b] *18*	4242	7/2$^-$	(E1(+M2))[h]	0.0014 *5*	δ<0.116 *34*; B(E1)(W.u.)=0.00035 *11* α=0.0014 *5*; α(K)=6.8×10^{-6} *19*; α(L)=6.1×10^{-7} *17*; α(M)=7.7×10^{-8} *21* α(N+..)=0.0014 *5* α(N)=4.2×10^{-9} *12*; α(IPF)=0.0014 *5*

$^{49}_{22}Ti_{27}$-10

$\gamma(^{49}$Ti) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	α[i]	Comments
8881.6	$7/2^+$	4739[b] *3*	1.0[b] *2*	4142	$(5/2^-)$			
		4807[b] *3*	3.0[b] *6*	4074.16	$5/2^-,7/2^-$	(E1(+M2))[f]	0.0015 *5*	δ<0.22 *7*; B(E1)(W.u.)=0.00010 *3* α=0.0015 *5*; α(K)=6.5×10^{-6} *17*; α(L)=5.7×10^{-7} *15*; α(M)=7.4×10^{-8} *20* α(N+..)=0.0015 *5* α(N)=4.0×10^{-9} *11*; α(IPF)=0.0015 *5*
		4942[b] *3*	6.0[b] *12*	3940.7	(5/2,7/2,9/2)	D,E2[@]		
		5034[b] *3*	2.0[b] *2*	3854.98	$5/2^-$	(E1(+M2))[f]	0.0016 *5*	δ<0.31 *8*; B(E1)(W.u.)=5.9×10^{-5} *15* α=0.0016 *5*; α(K)=6.1×10^{-6} *16*; α(L)=5.4×10^{-7} *14*; α(M)=6.9×10^{-8} *18* α(N+..)=0.0016 *5* α(N)=3.8×10^{-9} *10*; α(IPF)=0.0016 *5*
		5098[b] *3*	8.0[b] *16*	3784.7	$5/2^-,7/2^-$	(E1(+M2))[f]	0.0016 *5*	δ<0.049 *15*; B(E1)(W.u.)=0.0024 *7* α=0.0016 *5*; α(K)=5.9×10^{-6} *15*; α(L)=5.3×10^{-7} *14*; α(M)=6.8×10^{-8} *17* α(N+..)=0.0016 *5* α(N)=3.7×10^{-9} *10*; α(IPF)=0.0016 *5*
		5135[b] *3*	2[b]	3746	$5/2^-,7/2^-$	(E1(+M2))[f]	0.0016 *5*	δ<0.33; B(E1)(W.u.)=5.2×10^{-5} α=0.0016 *5*; α(K)=5.9×10^{-6} *15*; α(L)=5.2×10^{-7} *13*; α(M)=6.7×10^{-8} *17* α(N+..)=0.0016 *5* α(N)=3.6×10^{-9} *9*; α(IPF)=0.0016 *5*
		5182[b] *3*	10.0[b] *20*	3700.7	(5/2,7/2,9/2)	D,E2[@]		
		5268[b] *3*	1.0[b] *2*	3606	$(5/2)^+$			
		5374[b] *5*	1.0[b] *2*	3511	$5/2^-$	[E1(+M2)]	0.0017 *5*	δ<0.58 *9*; B(E1)(W.u.)=2.2×10^{-5} *9* α=0.0017 *5*; α(K)=5.5×10^{-6} *14*; α(L)=4.9×10^{-7} *12*; α(M)=6.3×10^{-8} *15* α(N+..)=0.0016 *5* α(N)=3.4×10^{-9} *9*; α(IPF)=0.0016 *5*
		5444[b] *3*	4.0[b] *8*	3428.25	$3/2^-$	[M2]	1.18×10^{-3} *17*	α=1.18×10^{-3} *17*; α(K)=6.70×10^{-6} *10*; α(L)=5.95×10^{-7} *9*; α(M)=7.61×10^{-8} *11*; α(N+..)=0.001175 *17* α(N)=4.16×10^{-9} *6*; α(IPF)=0.001175 *17*
		6365[b] *3*	7.0[b] *14*	2513.44	5/2,7/2,9/2	D		Mult.: from $\gamma(\theta)$ In (γ,γ').
		6410[b] *3*	3.0[b] *6*	2471.4	$(5/2)^-$	(E1(+M2))[f]		δ<0.50 *14*; B(E1)(W.u.)=4.0×10^{-5} *15*
		6620[b] *3*	1.0[b] *2*	2261.32	$(5/2)^-$	D,Q[@]		
		7123[b] *3*	16[b] *3*	1762.011	$5/2^-$	(E1(+M2))[h]		δ<0.069 *20*; B(E1)(W.u.)=0.00017 *5*
		7258[b] *3*	2.0[b] *4*	1622.93	$(5/2)^-$	D,Q[@]		
		8884[b] *2*	100[b] *20*	0.0	$7/2^-$	E1(+M2)		δ<0.0318 *28*; B(E1)(W.u.)=0.00056 *5* Mult.: from $\gamma(\theta)$ and linear polarization In (γ,γ).

Adopted Levels, Gammas (continued)

$\gamma(^{49}Ti)$ (continued)

E_i(level)	E_γ[†]	Comments

[†] From (n,γ), except As noted. Systematic uncertainty=5% for Iγ.
[‡] Systematic uncertainty=2.6×10^{-4}%.
[#] From (α,3nγ).
[@] From comparison to RUL.
[&] D from comparison to RUL. $\Delta\pi$=No from level scheme.
[a] From (p,p$'\gamma$).
[b] From (γ,γ'),(γ,n).
[c] From (d,pγ).
[d] Calibration for high-energy γ's In (n,γ) were based on the ^{2}H and ^{15}N neutron binding energies; if Sn(^{15}N)=10833.230 (2003Au03), these energies May need to Be reduced by up to 7 ppm.
[e] Eγ differs from calculated value by 3 to 4 σ.
[f] D,E2 from comparison to RUL. $\Delta\pi$=yes from level scheme.
[g] Nominal energies calculated from level energy differences.
[h] D from $\gamma(\theta)$ In (γ,γ'). $\Delta\pi$=yes from level scheme.
[i] 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.
[j] Placement of transition in the level scheme is uncertain.

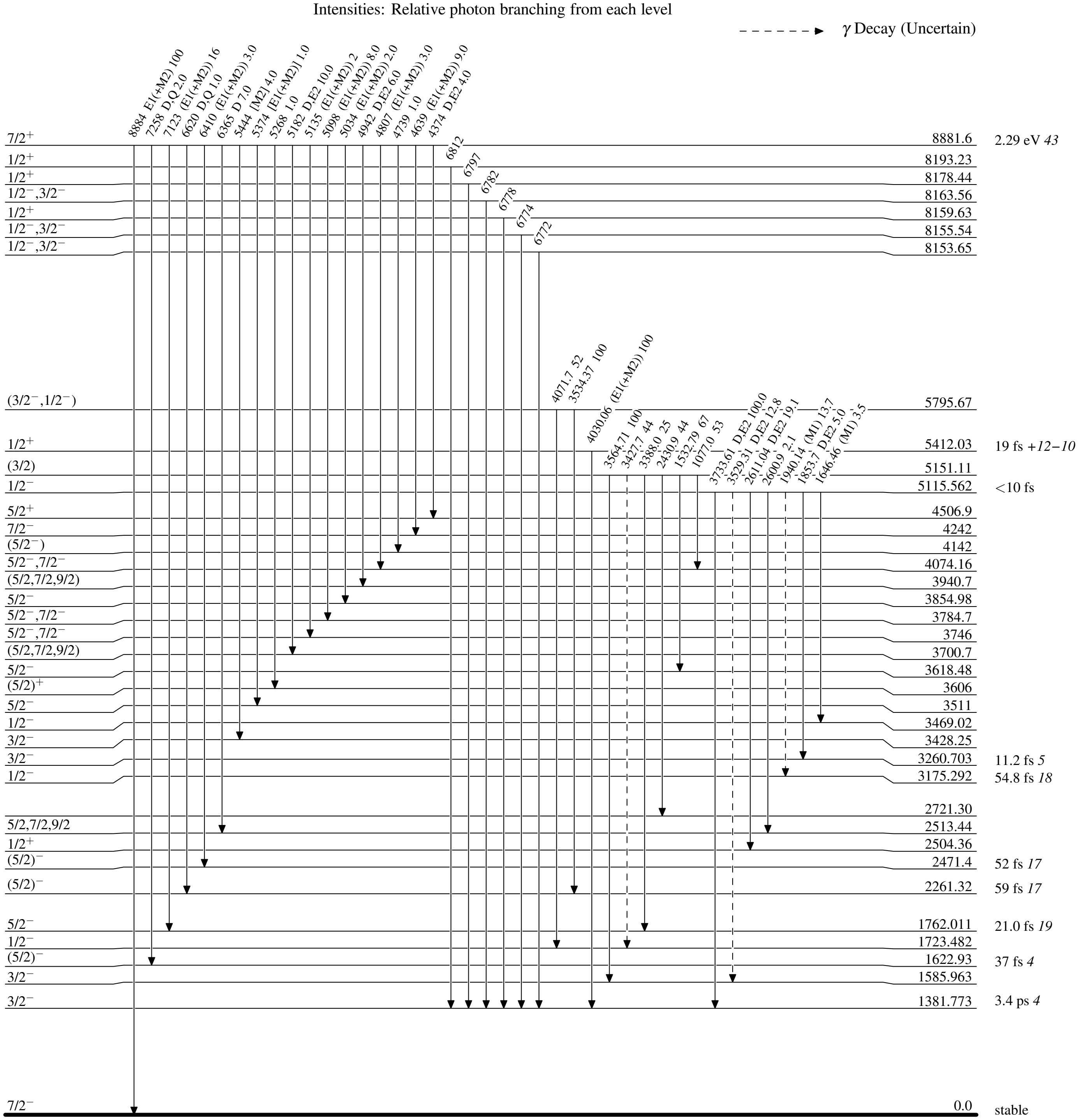
$^{49}_{22}Ti_{27}$-12

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

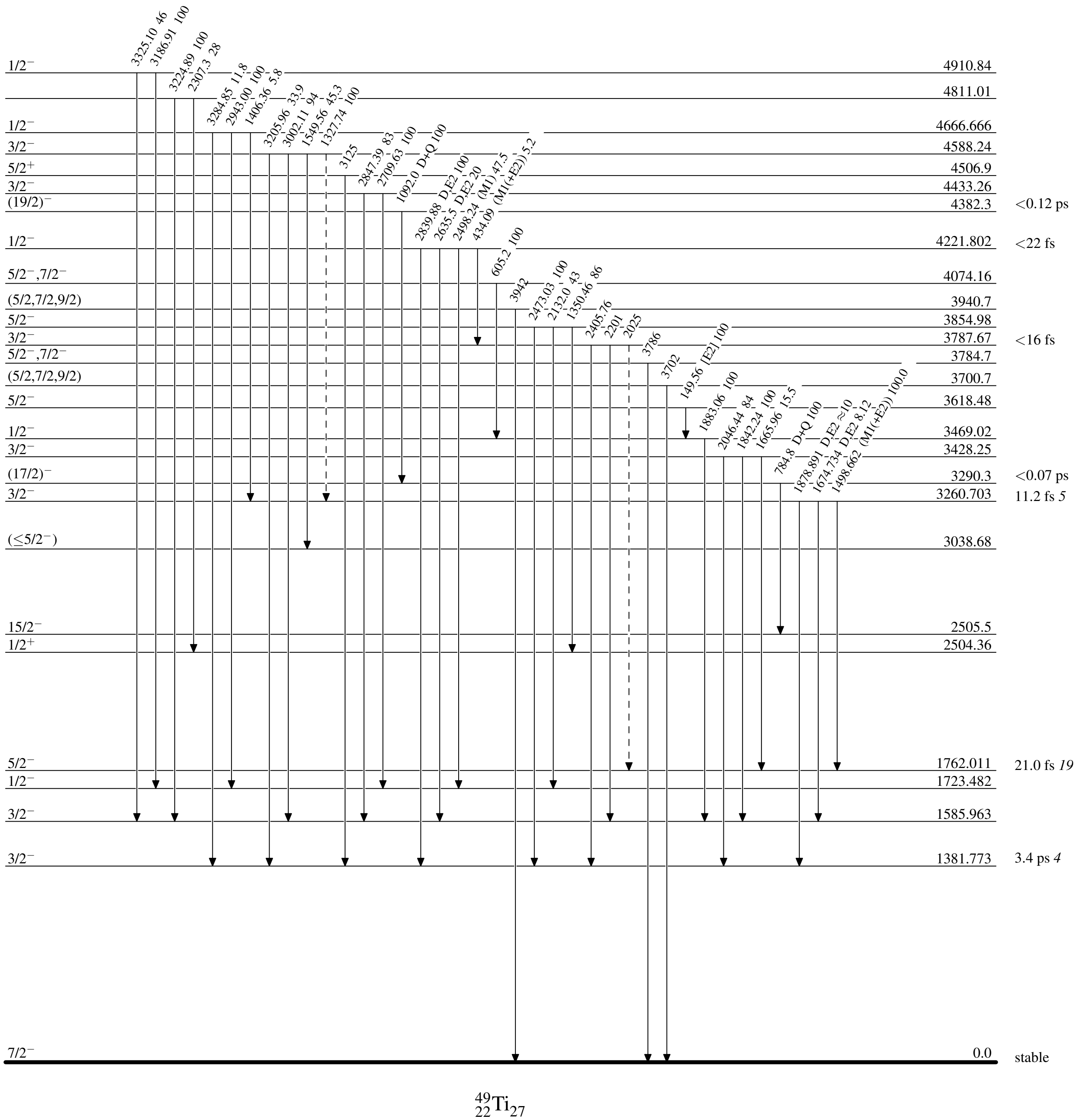


$^{49}_{22}Ti_{27}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

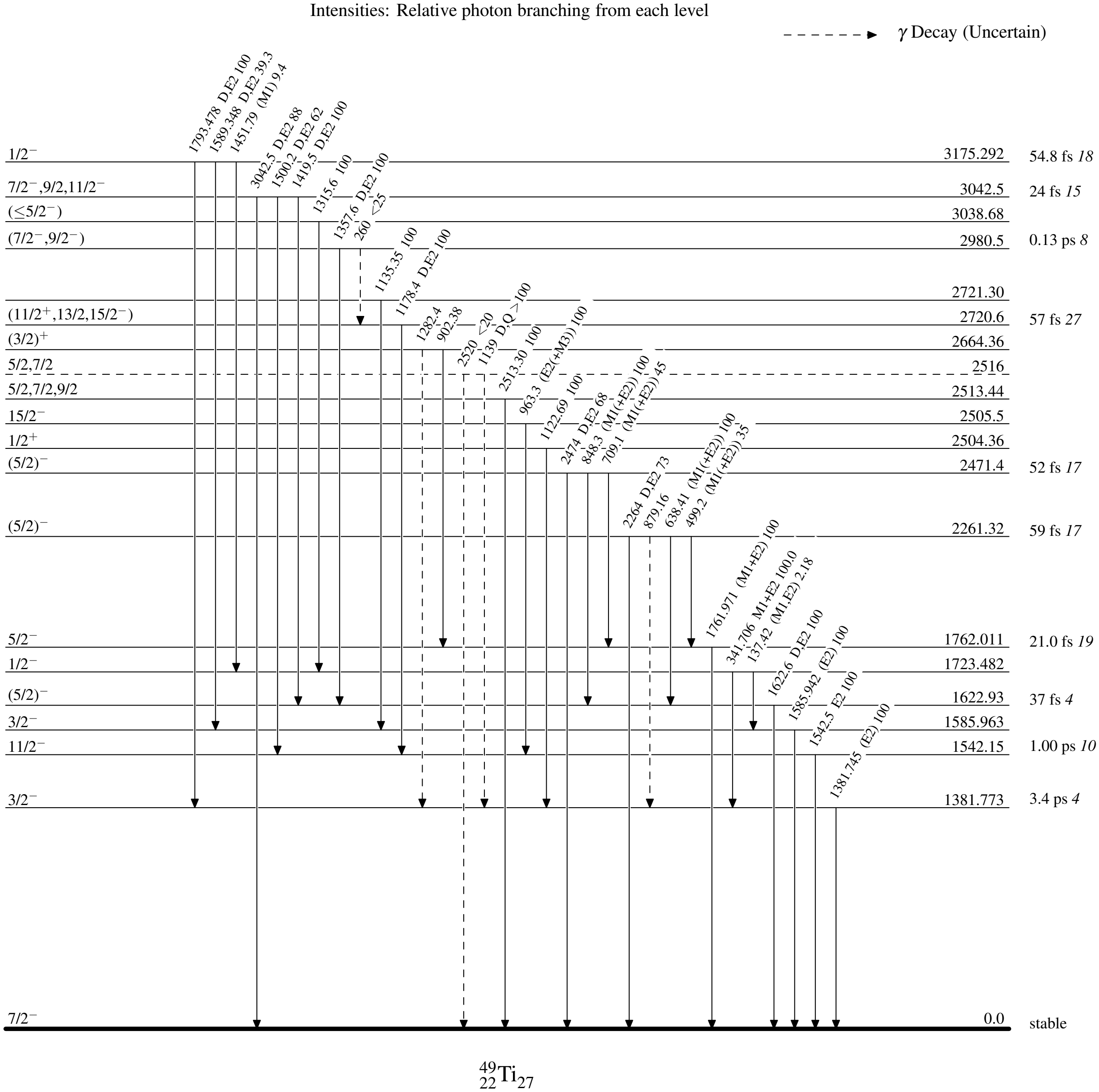


Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{49}_{22}Ti_{27}$