Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 157,1 (2019)	15-Apr-2019

Q(β^-)=−2207.6 *4*; S(n)=10939.19 *4*; S(p)=12159.4 *27*; Q(α)=−10717.2 *22* 2017Wa10
S(2n)=19081.59 *5*, S(2p)=21784.97 *9* (2017Wa10).
Other measurements:
Mass measurements: 2017Ka53 (using LEBIT at NSCL-MSU), 1972De39.
Hyperfine structure measurements:
2004Ga34, 2002Ca47, 2000Ga58: measured hyperfine structure for g.s. using collinear laser spectroscopy; deduced isotope shift, charge radius.
1996Fu23: measured optical isotope shift for g.s., deduced mean square nuclear charge radius.
1996Lu12, 1994Lu18, 1992Az03: measured hyperfine structure, deduced isotope shift for g.s., and mass shifts.
1995Ga44, 1994An35: measured hyperfine structure, deduced isotopes shifts, mass shifts.
1983Ku10, 1980Po01: measured pionic x-rays, strong interaction shifts, and widths; deduced rms radius.
1981Wo02: measured muonic x-rays; deduced charge radius, and isotone shifts.
Other reactions:
Additional information 1.
1990We05: ^{50}Ti(π^+,π^-),E=35 MeV. Measured $\sigma(\theta)$ for double isobaric analog transitions using a clamshell spectrometer.
1975We11: ^{51}V(γ,p),E=17.62 MeV. Measured σ and correlated the results to L(d,^{3}He)=3 spectroscopic factors for the first 0^+ and 4^+ states.
Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for 200 primary references dealing with various aspects of nuclear structure.

^{50}Ti Levels

States at 3771 observed by 1964Bj01 in (d,p) and at 4226, 5282, 5510, and 5919 keV observed by 1989Og01 in (^{16}O,^{14}C) have not been adopted by the evaluators.

Cross Reference (XREF) Flags

A	^{50}Sc β^- decay (102.5 s)	K	^{49}Ti(n,γ),(pol n,γ) E=thermal	U	^{50}V(d,^{2}He)
B	^{50}Sc β^- decay (0.35 s):?	L	^{49}Ti(n,γ),(n,n):resonances	V	^{51}V(e,e′p)
C	^{50}V ε decay (2.65×10^{17} y)	M	^{49}Ti(d,p)	W	^{51}V(n,d)
D	^{9}Be(^{46}Ar,5nγ)	N	^{49}Ti(d,pγ)	X	^{51}V(p,2p)
E	C(^{46}Ca,^{50}Tiγ)	O	^{50}Ti(γ,γ')	Y	^{51}V(d,^{3}He),(pol d,^{3}He)
F	^{48}Ca(^{3}He,n)	P	^{50}Ti(e,e′)	Z	^{51}V(α,α'p)
G	^{48}Ca(α,2nγ),(^{6}Li,3npγ)	Q	^{50}Ti(π^-,$\pi^{-\prime}$),(π^+,$\pi^{+\prime}$)	Others:	
H	^{48}Ca(^{9}Be,3n$\alpha\gamma$)	R	^{50}Ti(p,p′)	AA	^{52}Cr(^{14}C,^{16}O)
I	^{48}Ca(^{16}O,^{14}C),(^{18}O,^{16}C)	S	^{50}Ti(^{3}He,^{3}He′),(α,α')		
J	^{48}Ti(t,p),(t,pγ)	T	Coulomb excitation		

E(level)[†]	J$^{\pi}$[#]	T$_{1/2}$[‡]	XREF	Comments
0.0[b]	0^+	stable	ABCDEFGHIJK MNOPQRST VWXYZ	XREF: Others: AA XREF: B(?).
1553.794[b] *8*	2^+	1.047[a] ps *35*	ABCDEFGHIJK MNOPQRST VW Y	XREF: Others: AA μ=+2.89 *15* (2000Sp08,2014StZZ) Q=+0.08 *16* (1975To06,2016St14) XREF: B(?)S(1520). J$^{\pi}$: ΔJ=2, E2 1553.8γ to 0^+; L(α,α')=L(e,e′)=2. μ: from g=+1.444 *77* from transient magnetic fields in Coulomb excitation in inverse kinematics (2000Sp08)

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[‡]	XREF	Comments
				using $T_{1/2}$=1.12 ps for level half−life. Others: +2.2 *22* (2003Sp04, same group as 2000Sp08), 2.68 *84* (quoted by 1989Ra17 from D.Phil. thesis by B.J. Murphy, Oxford,1980; using $T_{1/2}$=0.97 ps). Q: reorientation method in Coul. ex. (1975To06). Other: −0.02 *9* (1970Ha24). Evaluated rms charge radius: $<r^2>^{1/2}$=3.5704 fm *22* (2013An02). Evaluated $\delta<r^2>(^{50}Ti,^{48}Ti)$=−0.160 fm^2 *7* (2013An02).
2674.932[b] *10*	4^+	5.3 ps *11*	A DE GHIJK MN PQRS VW Y	XREF: Others: AA XREF: M(2688)S(2640). J^{π}: ΔJ=2, E2 1121.1γ to 2^+; L(α,α′)=L(p,p′)=4 from 0^+. $T_{1/2}$: from RDM in (^{6}Li,3npγ). Other: <2.8 ns from γ(t) in (d,pγ); 6.22 ps *+21−19* from B(E4)(W.u.) in (e,e′). B(E4)(W.u.)=4.70 *15* (1971He08) in (e,e′).
3198.730[b] *21*	6^+	418 ps *20*	A D GHI K MN P R VW Y	XREF: Others: AA μ=+9.4 *10* (1976Bo25) J^{π}: ΔJ=2, E2 523.8γ to 4^+; L(p,p′)=6 from 0^+. $T_{1/2}$: βγ(t) in ^{50}Sc β^- decay. Other: <2.8 ns from γ(t) in (d,pγ). μ: g=+1.57 *17* measured using integral perturbed angular distribution (IPAD) method in (α,2nγ) (1976Bo25). +9.3 *10* in 2014StZZ compilation.
3862.81 *4*	$(2,3)^+$		K m R w	XREF: m(3879)R(3870)w(3800). J^{π}: L(p,p′)=2 from 0^+; 2867.4γ from 3^-.
3868.3 *20*	0^+	0.50 ps *23*	J m Q w	XREF: m(3879)Q(3870)w(3800). J^{π}: L(t,p)=0 from 0^+. $T_{1/2}$: from DSAM in (t,pγ).
3974.9? *10*			G	
4147? *7*	$3^-,4^-$		Y	E(level): may correspond to 4147.2 state but π suggests different level. J^{π}: L(d,^{3}He)=0 from $7/2^-$.
4147.210 *13*	4^+	33 fs *+7−5*	A G IJK MN RS	XREF: I(4180). J^{π}: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole; π=+ from L(d,p)=1; also L(p,p′)=4 from 0^+.
4172.003 *19*	3^+	>0.83 ps	A i K mN r y	XREF: i(4226). J^{π}: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole. Parity from L(d,p)=1 which gives J^{π}=2 to 5, π=+; L(d,^{3}He)=3 giving J=0 to 7, π=+; and $1^+,2^+,3^+$ from L=2 in (p,p′), (^{3}He,^{3}He′) and (α,α′) for 4172 doublet.
4172.8 *3*	(2^+)	<11 fs	iJ mN Qr y	XREF: i(4226). J^{π}: L(t,p)=(2) from 0^+. 2^+ from calculations of 1978Jo06. See also comment for 4171.96 level. $T_{1/2}$: other: ≤0.2 ps DSAM in (t,pγ).
4309.86 *11*	2^+	6.1 fs *12*	IJK MNOPQR Y	XREF: Others: AA XREF: N(4322). J^{π}: L(p,p′)=L(e,e′)=L(t,p)=2 from 0^+, L(d,p)=1 from $7/2^-$; 4309.7γ to 0^+. $T_{1/2}$: from B(E2)↑=0.0051 *8* in (e,e′) and adopted branching ratios. Others: 0.7 fs<$T_{1/2}$<4.2 fs from $\Gamma_{\gamma0}$ in (γ,γ′) and 4.3 fs from B(E2)↑ in

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)†	Jπ#	$T_{1/2}$‡	XREF	Comments
				(p,p′),(^{3}He,^{3}He),(α,α′); <2.8 ps from γ(t) in (d,pγ) and ≤60 fs from DSAM in (t,pγ).
4410.02 *3*	3^-	<2.8 ns	JK MN PQRS V Y	XREF: J(4424)P(4420)S(4380). Jπ: L(d,^{3}He)=0 from $7/2^-$; L(e,e′)=L(α,α′)=3 from 0^+. $T_{1/2}$: from γ(t) in (d,pγ). B(E3)(W.u.)=3.76 *15* from (e,e′) (1971He08).
4486.74 *6*	(2^+)		F K	XREF: F(4440). Jπ: primary γ from 3^-,4^-; 4486.0γ to 0^+; L(^{3}He,n)=(2) from 0^+.
4536 *20*			M	
4576 *20*			M	
4789.97 *6*	2^+	<14 fs	IJK MN RS Y	XREF: M(4805). Jπ: L(d,p)=1 from $7/2^-$; L(p,p′)=2 from 0^+; 4789.3γ to 0^+. But L(α,α′)=4 from 0^+ is inconsistent and could indicate a separate level.
4880.705 *15*	5^+	215 fs *+45−35*	A K MN P	XREF: M(4896). Jπ: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole; π from L(d,p)=1.
4928 *8*	(1 to 6)$^-$		j Y	XREF: j(4911). Jπ: L(d,^{3}He)=2 from $7/2^-$.
4940 *20*	$(2)^+$		j R	XREF: j(4911). Jπ: L(p,p′)=2 from 0^+.
5110 *8*			J M	E(level): weighted average of 5125 *15* from (t,p) and 5106 *8* from (d,p).
5186.103 *18*	$(3,4)^+$	<6.9 fs	jK MN	XREF: j(5198)M(5202). Jπ: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole; π from L(d,p)=1.
5191 *8*	3^-,4^-		j R Y	XREF: j(5198)R(5203). Jπ: L(d,^{3}He)=0+2 from $7/2^-$; L(p,p′)=3 from 0^+.
5282?			I	E(level): could be the 5191 level in other studies.
5334 *5*	$(4,5,6)^-$		M R V Y	E(level): weighted average of 5346 *8* (d,p); 5329 *5* (p,p′); 5333 *8* (d,^{3}He). Jπ: L(d,^{3}He)=2 from $7/2^-$; L(p,p′)=5,6 from 0^+.
5379.942 *19*	4^+	33 fs *+9−7*	A jK MN Rs	XREF: j(5395)s(5380). Jπ: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole; π from L(d,p)=1; also L(p,p′)=4 from 0^+.
5407 *8*	3^-,4^-		j s Y	XREF: j(5395)s(5380). Jπ: L(d,^{3}He)=0+2 from $7/2^-$.
5440.74 *20*	4^+,5^+		A IJ M R	XREF: I(5420). Jπ: L(p,p′)=4 from 0^+; L(d,p)=1+3 from $7/2^-$; log *ft*=6.4 from 5^+ parent.
5528 *8*	3^-,4^-		i Y	XREF: i(5510). Jπ: L(d,^{3}He)=0+2 from 0^+.
5547.81 *4*	(4^+)		i K	XREF: i(5510). Jπ: 2872.7γ to 4^+, 3993.9γ to 2^+, possible 2348.3γ to 6^+.
5560 *20*	$(3)^-$		R	Jπ: L(p,p′)=3 from 0^+.
5561 *6*	(2 to 5)$^+$		M	Jπ: L(d,p)=1 from $7/2^-$.
5600 *6*	(2 to 5)$^+$		M	Jπ: L(d,p)=1+3 from $7/2^-$.
5633 *15*	0^+		J	Jπ: L(t,p)=0 from 0^+.
5694.87 *8*	2^+,3^+		jK R	XREF: j(5697)R(5679).

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[‡]	XREF	Comments
				J^{π}: L(p,p′)=2 from 0^+; 3019.9γ to 4^+.
5717 *6*			j M	XREF: j(5697).
5771 *9*	$3^-,4^-$		Y	J^{π}: L(d,^{3}He)=0 from $7/2^-$.
5787 *5*	$(4)^+$		R	J^{π}: L(p,p′)=4 from 0^+.
5795 *9*	(1 to 6)$^-$		s V Y	XREF: s(5810). J^{π}: L(d,^{3}He)=2 from $7/2^-$.
5806.54 *16*	$4^+,5^+$		A K M Rs	XREF: M(5821)R(5817)s(5810). J^{π}: log *ft*=5.7 from 5^+ parent; L(p,p′)=4 from 0^+; L(d,p)=1+3 from $7/2^-$; primary γ from $3^-,4^-$ n-capture state.
5837.2 *6*	(2 to 5)$^{(+)}$	26 fs *+19−14*	i mN s	XREF: i(5850)m(5851)s(5810). J^{π}: 1690.0γ and 3162γ to 4^+; $2^+,3^+,4^+,5^+$ from L(d,p)=1+3 for 5837 and/ or 5880 levels.
5880 *9*	(0 to 7)$^+$		i m Y	XREF: i(5850)m(5851). J^{π}: L(d,^{3}He)=3 from $7/2^-$.
5945 *5*	$(3)^-$		i R xY	XREF: i(5919)x(6100). J^{π}: L(p,p′)=3 from 0^+.
5946.479 *22*	$3^+,4^+$	19 fs *5*	i K MN z	XREF: i(5919)z(6000). J^{π}: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole; π from L(d,p)=1 from $7/2^-$.
6044 *5*	$3^-,4^-$		R V xYz	XREF: x(6100)z(6000). J^{π}: L(d,^{3}He)=0 from $7/2^-$.
6045 *15*	0^+		J	J^{π}: L(t,p)=0 from 0^+.
6072 *15*	$(2)^+$		J M	E(level): from (d,pγ). Others: 6068 *15* from (t,p), 6079 *20* from (d,p). J^{π}: L(t,p)=2 from 0^+; L(d,p)=1 from $7/2^-$.
6123.15 *4*	(4^+)	38 fs *+12−9*	K N R	J^{π}: 2924.0γ to 6^+, 1636.5γ to (2^+); D,E2 γ rays to $1^-,2^+$ and 6^+; spin=(3,4,5) from nuclear orientation and CP in (n,γ).
6136.3[c] *6*	$(7)^+$		D GH M Y	J^{π}: ΔJ=1, M1+E2 2937.6γ to 6^+. But L(d,p)=1+3 from $7/2^-$ for a level at 6138 is inconsistent; it could be for the 6123 level.
6156.47 *22*	$(2,3,4^+)$		K	J^{π}: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole. 4602.5γ to 2^+.
6172 *7*	(2 to 5)$^+$		M R Y	XREF: M(6176)R(6166)Y(6191). E(level): weighted average of 6176 *20* in (d,p), 6166 *5* in (p,p) and 6191 *9* in (d,^{3}He). J^{π}: L(d,^{3}He)=3 and L(d,p)=1 from $7/2^-$.
6212 *5*	(1 to 6)$^{(-)}$		J M R	E(level): weighted average of 6207 *15* from (t,p), 6210 *20* from (d,p), and 6213 *5* from (p,p′). J^{π}: L(d,p)=(2) from $7/2^-$.
6249 *6*	(0 to 7)$^+$		M Y	E(level): weighted average of 6250 *6* from (d,p) and 6248 *9* from (d,^{3}He). J^{π}: L(d,^{3}He)=3 from $7/2^-$.
6301.81 *4*	$(1,2,3)^-$		K M Y	J^{π}: L(d,^{3}He)=2 from $7/2^-$; 4747.7γ to 2^+.
6379.88 *14*	$(5)^-$	<19 fs	K N r v Y	XREF: r(6380)v(6386). J^{π}: L(d,^{3}He)=2 from $7/2^-$; 3181.9$\gamma\gamma$ to 6^+; possible 2232.3γ to 4^+.
6392 *6*	(2 to 5)$^+$		M r	XREF: r(6380). J^{π}: L(d,p)=1 from $7/2^-$.

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)†	Jπ#	$T_{1/2}$‡	XREF	Comments
6399.81 *15*	(3)⁻		K v Y	XREF: v(6386). Jπ: L(d,^{3}He)=0 from 7/2⁻; 4845.6γ to 2⁺.
6.4×10³ *5*			U	E(level): energy bin=5.9-6.9 MeV. L(d,^{2}H)=0 from 6⁺ target for a wide bin.
6461 *9*	(1 to 6)⁻		Y	Jπ: L(d,^{3}He)=2 from 7/2⁻.
6481.2 *4*	3⁺	<17 fs	J MN R	Jπ: L(p,p′)=4 from 0⁺; L(t,p)=2 from 0⁺; also L(d,p)=1 from 7/2⁻.
6521.41 *4*	3⁺,4⁺	7.6 fs +*35*−*28*	K MN R Y	Jπ: L(p,p′)=4 from 0⁺; 1730.8γ to 2⁺.
6540.7[c] *8*	(8)⁺		D GH	Jπ: ΔJ=1, M1+E2 404.4γ to (7)⁺.
6548 *15*			J	
6583 *10*	(1 to 6)⁻		m s V Y	XREF: m(6592)s(6570). Jπ: L(d,^{3}He)=2 from 7/2⁻.
6608 *5*	(3)⁻		j m Rs Y	XREF: j(6624)m(6592)s(6570). E(level): weighted average of 6609 *5* from (p,p′), and 6606 *10* from (d,^{3}He). Jπ: L(p,p′)=3 from 0⁺.
6636 *6*	(0 to 7)⁺		j M	XREF: j(6624). Jπ: L(d,p)=3 from 7/2⁻.
6665 *10*	(1 to 6)⁻		M Y	XREF: M(6697). Jπ: L(d,^{3}He)=2 from 7/2⁻.
6710.570 *24*	4⁺	11 fs *5*	jK MN R Y	XREF: j(6724)M(6726). Jπ: spin from nuclear orientation and circ pol in (n,γ) assuming the primary γ rays are dipole; π=+ from L(d,^{3}He)=1; also L(p,p′)=4 from 0⁺.
6729.86 *6*	3⁻		jK M S	XREF: j(6724)M(6744)S(6720). Jπ: L(α,α′)=3.
6766 *10*	(0 to 7)⁺		J Y	E(level): weighted average of 6756 *15* from (t,p) and 6770 *10* from (d,^{3}He). Jπ: L(d,^{3}He)=3 from 7/2⁻.
6770.5[c] *9*	(9)⁺		D GH	Jπ: ΔJ=1, M1+E2 229.8γ to (8)⁺.
6837.64 *7*	(2⁺,3,4⁺)		K	Jπ: 1457.6γ to 4⁺ and 5283.4γ to 2⁺.
6849.05 *8*	(5)⁻		K Y	Jπ: L(d,^{3}He)=2 from 7/2⁻; primary 4089.9γ from 3⁻,4⁻; 2700.6γ to 4⁺ and 3649.9γ to 6⁺;
6864 *5*	(5)⁺		M R	Jπ: L(d,p)=1+3 from 7/2⁻; L(p,p′)=5,6 from 0⁺.
6933 *15*			J M	E(level): weighted average of 6945 *15* from (t,p) and 6913 *20* from (d,p).
6975 *5*	3⁻,4⁻		J M R v Y	XREF: v(7000). E(level): weighted average of 6992 *15* from (t,p), 6986 *20* from (d,p), 6975 *5* from (p,p′), and 6963 *10* from (d,^{3}He). Jπ: L(d,^{3}He)=0 from 7/2⁻.
7029.39 *25*	2⁺,3⁺,4⁺		jK M y	XREF: j(7041)y(7037). Jπ: L(d,p)=1 from 7/2⁻; 2719.1γ to 2⁺; L(t,p)=2 from 0⁺ for 7029 and/or 7049 levels.
7047 *10*	(3)⁻		R v	XREF: v(7000). Jπ: L(p,p′)=3 from 0⁺.
7049 *20*	(2 to 5)⁺		j M y	XREF: j(7041)y(7037). Jπ: L(d,p)=1 from 7/2⁻.
7078.72 *23*	(3)⁻		jK M R y	XREF: j(7091)y(7083).

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)[†]	J^{π}[#]	XREF	Comments
			J^{π}: L(p,p′)=3 from 0+; L(d,^{3}He)=2 from 7/2−; 4402.1γ to 4+ and 5525.5γ to 2+. But L(d,p)=3 from 7/2− for a level at 7978 is inconsistent.
7094 *20*	(1 to 6)−	j M y	XREF: j(7091)y(7083). J^{π}: L(d,p)=2 from 7/2−.
7115 *10*	(1)+[&]	R	J^{π}: L(p,p′)=0 from 0+.
7132 *20*	3−	M S	E(level): from (d,p). J^{π}: L(α,α′)=3 from 0+.
7.19×10^3 *6*	0+	F I	J^{π}: L(^{3}He,n)=0; also L=0 in (^{16}O,^{14}C).
7210 *10*	(3)−	j R	XREF: j(7230). J^{π}: L(p,p′)=3 from 0+.
7232.19 *23*	(2)+	jK M R	XREF: j(7230). J^{π}: L(d,p)=1 from 7/2−; L(p,p′)=2 from 0+.
7249 *6*	(2 to 5)+	M	J^{π}: L(d,p)=1 from 7/2−.
7280 *20*	(1 to 7)+	M	J^{π}: L(d,p)=3 from 7/2−.
7293 *10*		P	
7335 *10*	(2)+	R	J^{π}: L(p,p′)=2 from 0+.
7382 *9*	(3)−	j M R	XREF: j(7387)M(7367)R(7407). E(level): weighted average of 7387 *6* from (d,p) and 7367 *10* from (p,p′). J^{π}: L(p,p′)=3 from 0+.
7407 *20*	(2 to 5)+	j M	XREF: j(7387). J^{π}: L(d,p)=1 from 7/2−.
7441 *15*		J M	E(level): weighted average of 7438 *15* from (t,p) and 7447 *20* from (d,p) (p,p′).
7471 *20*	(2 to 5)+	j M r	XREF: j(7494)r(7482). J^{π}: L(d,p)=1 from 7/2−.
7482.96 *7*	(2)+	jK M r	XREF: j(7494)M(7504)r(7482). J^{π}: L(d,p)=1 from 7/2−; 5929.1γ to 2+; L(t,p)=2 for 7471 and/or 7483 levels.
7536 *10*	(3)−	m R	XREF: m(7550). J^{π}: L(p,p′)=3 from 0+.
7539.5? *22*		G m	XREF: m(7550). J^{π}: possible 770.2γ to (9)+ suggests high spin.
7572.6[c] *11*	(10)+	D GH	J^{π}: ΔJ=1, M1+E2 802.1γ to (9)+.
7577 *10*	0+,1+	J m R	XREF: m(7550). E(level): from (p,p′). Other: 7579 *15* from (t,p). J^{π}: L(p,p′)=0 from 0+.
7605 *11*	(3−,4−)	V Y	E(level): from (d,^{3}He). J^{π}: L(d,^{3}He)=(0) from 7/2−.
7631 *20*	(5)+	M R	XREF: R(7650). J^{π}: L(d,p)=1 from 7/2−; L(p,p′)=5,6 from 0+.
7667 *15*	(2)+	J M	E(level): weighted average of 7670 *15* (t,p) and 7663 *20* (d,p). J^{π}: L(t,p)=2 from 0+.
7699 *10*	(3)−	J Rs Y	XREF: s(7720). E(level): weighted average of 7701 *15* (t,p), 7700 *10* (p,p′) and 7697 *11* (d,^{3}He). J^{π}: L(p,p′)=3 from 0+; L(d,^{3}He)=(0) from 7/2−.
7734 *15*		J s	XREF: s(7720).
7808 *15*	(0+)	J	J^{π}: L(t,p)=(0) from 0+.
7867 *10*	0+,1+	J R	E(level): weighted average of 7871 *15* from (t,p) and 7862 *10* from (p,p′). J^{π}: L(p,p′)=0 from 0+.
7924 *10*	(5)−	J R	E(level): weighted average of 7921 *15* from (t,p) and 7925 *10* from (p,p′). J^{π}: L(p,p′)=5 from 0+.

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)†	Jπ#	XREF	Comments
7941 *15*		J	
8034 *10*	(4)$^+$	J R	E(level): weighted average of 8031 *15* from (t,p) and 8035 *10* from (p,p′). Jπ: L(p,p′)=4 from 0$^+$.
8079 *10*	(1)$^+$&	J R	E(level): weighted average of 8089 *15* from (t,p) and 8074 *10* from (p,p′). Jπ: L(p,p′)=0 from 0$^+$.
8150 *10*		J R	E(level): weighted average of 8156 *15* from (t,p) and 8148 *10* from (p,p′).
8.15×10^3 *25*		U	E(level): energy bin=7.9-8.4 MeV. L(d,^{2}H)=0 from 6$^+$ target for a wide bin.
8203 *10*	(3)$^-$	J R	E(level): weighted average of 8200 *15* from (t,p) and 8205 *10* from (p,p′). Jπ: L(p,p′)=3 from 0$^+$.
8241 *10*	0$^+$,1$^+$	J R	E(level): weighted average of 8247 *15* from and 8238 *10* from (p,p′). Jπ: L(p,p′)=0 from 0$^+$.
8257.7? *24*		G	
8290 *10*	(3)$^-$	J R	E(level): weighted average of 8292 *15* from (t,p) and 8287 *10* from (p,p′). Jπ: L(p,p′)=3 from 0$^+$.
8407 *12*		P	E(level): Unresolved purely transverse multiplet in (e,e′).
8444 *10*	0$^+$,1$^+$	R	Jπ: L(p,p′)=0 from 0$^+$.
8.56×10^3 *2*	1$^+$	P	Jπ: M1 excitation in (e,e′).
8578 *10*	(3)$^-$	R	E(level): due to Jπ consideration, level is different from 8560 level. Jπ: L(p,p′)=3 from 0$^+$.
8606 *10*	(1)$^+$&	R	Jπ: L(p,p′)=0 from 0$^+$.
8.64×10^3 *2*	2$^-$	P	Jπ: M2 excitation in (e,e′).
8.65×10^3 *25*		U	E(level): energy bin=8.4-8.9 MeV. L(d,^{2}H)=0 from 6$^+$ target for a wide bin.
8725 *10*	(2$^-$)	P R	E(level): weighted average of 8720 *2* from (e,e′) and 8726 *10* from (p,p′). Jπ: L(p,p′)=(1) from 0$^+$; M2,(E3) excitation in (e,e′).
8755 *7*		P	
8793.7c *17*	(11$^+$)	D GH	Jπ: ΔJ=1, (M1+E2) 1221.1γ to (10)$^+$; J=11 favored from excitation function in (α,2nγ).
8.81×10^3 *2*	1$^+$&	P R	E(level): from (e,e′) and (p,p′). Jπ: M1 excitation in (e,e′); L(p,p′)=0 from 0$^+$.
8815 *10*	(3)$^-$	R	Jπ: L(p,p′)=3 from 0$^+$.
8.87×10^3 *2*	(2$^+$)	P	Jπ: (E2) excitation in (e,e′).
8883 *10*	(2,3)$^-$	P R	E(level): weighted average of 8890 *2* from (e,e′) and 8881 *10* from (p,p′). Jπ: L(p,p′)=3; Q,(E3) excitation in (e,e′).
8973 *10*	(3)$^-$	P R	E(level): weighted average of 8980 *2* from (e,e′) and 8971 *10* from (p,p′). Jπ: L(p,p′)=3 from 0$^+$; (E3) excitation in (e,e′).
9.03×10^3 *2*	(1)$^+$&	R	Jπ: L(p,p′)=0 from 0$^+$.
9.05×10^3 *2*	2$^-$	P	Jπ: M2 excitation in (e,e′).
9061 *12*		P	
9127 *10*		R	
9188 *15*		P	
9.21×10^3 *2*	1$^+$&	P R	E(level): from (e,e′) and (p,p′). Jπ: L(p,p′)=0 from 0$^+$; E1,(M1) excitation in (e,e′).
9232 *10*	(4$^+$,5$^-$)	R	Jπ: L(p,p′)=4,5 from 0$^+$.
9240 *20*	(1$^+$,2)	P	Jπ: M1,M2,(E2) excitation in (e,e′).

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)†	Jπ#	XREF	Comments
9.28×10^3 *2*	(1,2$^-$)	P	Jπ: M1,(M2,E1) excitation in (e,e′).
9282 *10*	(5$^-$,6$^+$)	R	Jπ: L(p,p′)=5,6 from 0$^+$.
9.3×10^3 *4*		U	E(level): energy bin=8.9-9.7 MeV. L(d,^{2}H)=0(+1) from 6$^+$ target for a wide bin.
9339 *10*	(3)$^-$	R	Jπ: L(p,p′)=3 from 0$^+$.
9368 *10*	(1$^+$)	P R	E(level): weighted average of 9370 *2* from (e,e′) and 9367 *10* from (p,p′). Jπ: M1,(Q) excitation in (e,e′).
9391 *10*	(4)$^+$	R	Jπ: L(p,p′)=4 from 0$^+$.
9442 *10*		P	
9504 *10*		R	
9508 *10*	(5$^-$,6$^+$)	R	Jπ: L(p,p′)=5,6 from 0$^+$.
9550 *10*		R	
9614 *10*	(1)$^+$&	R	Jπ: L(p,p′)=0 from 0$^+$.
9752 *10*	(3)$^-$	R	Jπ: L(p,p′)=3 from 0$^+$.
9790	0$^+$,1$^+$	R	Jπ: L(p,p′)=0 from 0$^+$.
9809 *10*		R	
9842 *10*	(4$^-$,5$^+$)	R	Jπ: L(p,p′)=4,5 from 0$^+$.
9909 *10*	(3)$^-$	R	Jπ: L(p,p′)=3 from 0$^+$.
9957 *14*	1$^+$&	P R	E(level): weighted average of 9930 *2* from (e,e′) and 9964 *10* from (p,p′). Jπ: L(p,p′)=0 from 0$^+$; M1 excitation in (e,e′).
9999 *10*	(3)$^-$	R	Jπ: L(p,p′)=3 from 0$^+$.
10.00×10^3 *2*	(2$^-$,1$^+$)	P	Jπ: M2,(M1) excitation in (e,e′).
10045 *10*	(1)$^+$&	P R	E(level): weighted average of 10030 *2* from (e,e′), and 10049 *10* from (p,p′). Jπ: M1+E3 excitation in (e,e′); L(p,p′)=0 from 0$^+$.
10.05×10^3 *35*		U	E(level): energy bin=9.7-10.4 MeV. L(d,^{2}H)=0(+1) from 6$^+$ target for a wide bin.
10.14×10^3 *2*	(1$^+$,2$^-$)	P	Jπ: M1,M2 excitation in (e,e′).
10162 *10*	1$^+$	P R	E(level): weighted average of 10170 *2* from (e,e′), and 10160 *10* from (p,p′). Jπ: M1 excitation in (e,e′); L(p,p′)=0 from 0$^+$.
10206 *10*	(1)$^+$	f P R	XREF: f(10220). E(level): weighted average of 10210 *2* from (e,e′), and 10205 *10* from (p,p′). Jπ: L(p,p′)=0 from 0$^+$; E1,(M1) excitation in (e,e′).
10240 *10*	(1$^+$,2$^-$,3$^-$)	f P R	XREF: f(10220). E(level): weighted average of 10250 *2* from (e,e′), and 10237 *10* from (p,p′). Jπ: E3,(M1,M2) excitation in (e,e′).
10357 *14*	1$^+$	P R	E(level): weighted average of 10330 *2* from (e,e′), and 10364 *10* from (p,p′). Jπ: M1 excitation in (e,e′); L(p,p′)=0 from 0$^+$.
10.38×10^3 *2*	(2$^-$,1$^+$)	P	Jπ: M2,(M1) excitation in (e,e′).
10472 *11*	1$^+$	P R	E(level): weighted average of 10450 *2* from (e,e′) and 10478 *10* from (p,p′). Jπ: M1 excitation in (e,e′); L(p,p′)=0 from 0$^+$.
10495 *10*	(3)$^-$	R	Jπ: L(p,p′)=3 from 0$^+$.
10.54×10^3 *2*	(1$^+$,2$^-$)	P	Jπ: M1,(M2) excitation in (e,e′).
10.58×10^3 *2*	1$^+$	P R	Jπ: M1 excitation in (e,e′); L(p,p′)=0 for a doublet.
10.66×10^3 *2*	1$^+$	P	Jπ: M1 excitation in (e,e′).
10.80×10^3 *2*	1$^+$	P R	Jπ: L(p,p′)=0 from 0$^+$; M1,(E1,Q) excitation in (e,e′).
10.87×10^3 *2*	(1,2$^-$)	P	Jπ: E1,M1,(M2) excitation in (e,e′).

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)†	J^{π}#	$T_{1/2}$‡	XREF	Comments
10.90×10^3 *2*	2$^+$		P	J^{π}: E2 excitation in (e,e′).
10.91×10^3 *2*	(1)$^+$&		R	J^{π}: L(p,p′)=0 from 0$^+$.
(10939.184 *15*)	3$^-$,4$^-$		K	E(level): S(n) from 2017Wa10; held fixed in least-squares adjustment. J^{π}: s-wave neutron capture on a 7/2$^-$ target.
10942.94 *4*	3$^-$@	0.26@ keV *3*	L	
10943.89 *4*	(2 to 5)$^+$@		L	
10946.67 *4*	(2 to 5)$^+$@		L	
10947.45 *5*	4$^-$@	0.28@ keV *3*	L	
10.95×10^3 *2*	1		P	J^{π}: dipole excitation in (e,e′).
10952.09 *4*	(2 to 5)$^+$@		L	
10952.89 *4*	(2 to 5)$^+$@		L	
10953.67 *5*	(2 to 5)$^+$@		L	
10955.91 *5*	(2 to 5)$^+$@		L	
10957.41 *5*	(2 to 5)$^+$@		L	
10957.86 *5*	3$^-$@	126@ eV *23*	L	
10960.63 *5*	3$^-$@	149@ eV *17*	L	
10961.65 *5*	(2 to 5)$^+$@		L	
10961.73 *5*	3$^-$@	0.65@ keV *12*	L	
10964.51 *6*	(2 to 5)$^+$@		L	
10965.94 *6*	4$^-$@	0.37@ keV *6*	L	
10966.93 *6*	(2 to 5)$^+$@		L	
10967.25 *6*	(2 to 5)$^+$@		L	
10968.22 *6*	(2 to 5)$^+$@		L	
10968.39 *6*	(2 to 5)$^+$@		L	
10.97×10^3? *2*	(2$^-$,3$^+$)		P	J^{π}: M2,(M3) excitation in (e,e′).
10970.13 *6*		32@ eV *16*	L	
10970.94 *6*	4$^-$@	1.4@ keV *4*	L	
10972.61 *4*	(2 to 5)$^+$@		L	
10973.80 *6*	(2 to 5)$^+$@		L	
10974.64 *6*	(2 to 5)$^+$@		L	
10975.15 *6*		0.0026@ eV *7*	L	
10975.41 *6*	(2 to 5)$^+$@	0.39@ keV *10*	L	
10976.81 *6*	4$^-$@	1.51@ keV *18*	L	
10980.84 *6*	(3)$^+$@		L	
10981.05 *6*			L	
10981.76 *6*	(4)$^+$@		L	
10982.31 *7*	(3)$^+$@		L	
10984.21 *7*	(3)$^+$@		L	
10987.91 *7*	(3)$^+$@		L	
10988.38 *7*	@		L	
10988.63 *7*	(5)$^+$@		L	
10989.60 *7*	(3)@	0.23@ keV *6*	L	
10990.11 *8*			L	

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[‡]	XREF	Comments
10991.32 *8*			L	
10994.86 *8*	4⁻[@]	0.53[@] keV *9*	L	
10996.41 *8*			L	
10996.72 *8*			L	
10997.39 *8*			L	
10998.05 *9*	3⁻[@]	0.45[@] keV *11*	L	
10998.31 *9*	(2 to 5)⁺[@]		L	
11000.04 *10*	(2 to 5)⁺[@]		L	
11001.13 *10*	(3)[@]	0.23[@] keV *12*	L	
11001.34 *10*	(2 to 5)⁺[@]		L	
11005.43 *10*	3⁻[@]		L	
11005.91 *10*	(2 to 5)⁺[@]		L	
11009.74 *10*	(2 to 5)⁺[@]		L	
11009.93 *10*	(2 to 5)⁺[@]		L	
11010.47 *10*	(2 to 5)⁺[@]		L	
11014.34 *11*	4⁻[@]	0.89[@] keV *20*	L	
11015.54 *11*			L	
11015.96 *11*	(2 to 5)⁺[@]		L	
11.03×10^3 *2*	(1,2⁻)		P	J^{π}: M1,(M2,E1) excitation in (e,e′).
11033.8 *3*	3⁻[@]		L	
11043.4 *3*	3⁻[@]		L	
11.07×10^3 *2*	1		P	J^{π}: dipole excitation in (e,e′).
11075.2 *4*	4⁻[@]		L	
11082.0 *4*	3⁻[@]		L	
11087.3 *5*	3⁻[@]		L	
11088.3 *5*	4⁻[@]		L	
11106.3 *5*	4⁻[@]		L	
11108.0 *5*	4⁻[@]		L	
11111.8 *5*	4⁻[@]		L	
11120.2 *5*	3⁻[@]		L	
11121.2 *6*	4⁻[@]		L	
11123.1 *6*	3⁻[@]		L	
11.13×10^3 *2*	(2,1⁺)		P	J^{π}: M2,(M1,E2) excitation in (e,e′).
11132.2 *6*	4⁻[@]		L	
11143.5 *6*	3⁻[@]		L	
11150.8 *6*	4⁻[@]		L	
11159.2 *7*	3⁻[@]		L	
11173.4 *7*	4⁻[@]		L	
11.19×10^3 *2*	(1⁻,2⁻)		P	J^{π}: E1,(M2) excitation in (e,e′).
11.22×10^3 *2*	(2⁻,1⁺)		P	J^{π}: M2,(M1) excitation in (e,e′).
11.29×10^3 *2*	3		P	J^{π}: octupole excitation in (e,e′).
11.3×10^3 *9*			U	E(level): energy bin=10.4-12.2 MeV. L(d,^{2}H)=0+1 from 6⁺ target for a wide bin.
11.31×10^3 *2*	(2⁻,1⁺)		P	J^{π}: M2,(M1) excitation in (e,e′).
11.35×10^3 *2*	(2⁻,1⁺)		P	J^{π}: M2,(M1) excitation in (e,e′).

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Adopted Levels, Gammas (continued)

^{50}Ti Levels (continued)

E(level)[†]	J^{π}[#]	XREF	Comments
11.42×10^3 *2*	2$^-$	P	J$^\pi$: M2 excitation in (e,e′).
11.61×10^3 *2*	1	P	J$^\pi$: E1,(M1) excitation in (e,e′).
11.83×10^3 *2*	2$^-$	P	J$^\pi$: M2 excitation in (e,e′).
13.83×10^3 *6*	(2$^+$)	F	J$^\pi$: L(^{3}He,n)=(2) from 0$^+$.
14.1×10^3 *7*		U	E(level): energy bin=13.4-14.8 MeV. L(d,^{2}H)=1(+0) from 6$^+$ target for a wide bin.
15.39×10^3 *2*	(1)$^+$[&]	R	J$^\pi$: L(p,p′)=0 from 0$^+$.
16.01×10^3 *6*	(0$^+$)	F	J$^\pi$: L(^{3}He,n)=(0) from 0$^+$.
16.58×10^3 *6*	0$^+$	F	J$^\pi$: L(^{3}He,n)=0 from 0$^+$.

[†] From least-squares fit to Eγ data including primary γ rays from (n,γ), keeping the capture-state energy fixed. For levels not populated in γ-ray studies, values are the weighted averages of all the available data. In addition there are high-lying excitations at 6, 11 and 16 MeV in ^{51}V(α,α'p) reaction.

[‡] $T_{1/2}$ from DSAM in (d,pγ), except as noted.

[#] In ^{48}Ca(^{3}He,n) and ^{48}Ti(t,p) reactions, where J^π(target g.s.)=0$^+$, implied J^π=0$^+$ for L=0, 2$^+$ for L=2, 3$^-$ for L=3, 4$^+$ for L=4, assuming that for strong groups, the two neutrons or two protons are identical particles in S=0 state, whereas for weaker groups, S=1 state is also possible leading to unnatural−parity states with J=L−1 and L+1. In ^{49}Ti(d,p); ^{51}V(e,e′p) and ^{51}V(d,^{3}He) where J^π(target g.s.)=7/2$^-$, implied J^π=3$^-$,4$^-$ for L=0,0+2; 2 to 5, π=+ for L=1,1+3; 1 to 6, π=− for L=2,2+4; 0 to 7, π=+ for L=3; and 0 to 8, π=− for L=4. In ^{50}V(d,^{2}He) with J^π(target g.s.=6$^+$), implied J^π=5$^+$,6$^+$,7$^+$ for L=0; and 4 to 8, π=− for L=1.

[@] From ^{49}Ti(n,γ),(n,n):resonances.

[&] From L(p,p′)=0 in E_p=201 MeV and theory, $V_{\sigma\tau}$ part of the nucleon-nucleon interaction is strongly enhanced compared to the V_{00} part through which 0$^+$ states may be excited and also with respect to the $V_{\sigma 0}$ and $V_{0\tau}$ parts.

[a] Mean lifetime τ=1.51 ps *7* from weighted average of the following experimental results for mean lifetime τ=1.62 ps *7* (2000Sp08, DSAM in Coul. ex.), 1.73 ps *20* in 2003Sp04, DSAM in C(^{46}Ca,^{50}Ti), same group as 2000Sp08); 1.30 ps *40* (1976Ra03, from width in (γ,γ')); 1.44 ps *14* (from B(E2)↑=0.0315 *30* in Coul. ex. 1975To06); 1.10 ps *15* (1972WaYZ, DSAM in Coul. ex.); 1.469 ps *48* (from B(E2)↑=0.0307 *10* in (e,e′) 1971He08, uncertainty increased to 5% in averaging); 1.38 ps *13* (from B(E2)↑=0.033*30* in Coul. ex. 1970Ha24); 1.74 ps *13* (from B(E2)↑=0.026 *2* in Coul. ex. 1965Si02, 0.024 *2* in 1965Si02 reanalyzed by 1970Ha24); 1.17 ps *23* (from B(E2)↑=0.040 *8* in Coul. ex. 1962Va22). Other: 2.7 ps *5* (from B(E2)↑=0.0173 *35* in Coul. ex. 1967Af03) seems discrepant thus not used in the averaging procedure. 2016Pr01 evaluation gives τ=1.64 ps *+10−9* from model-independent analyses, and 1.59 ps *8*, which includes methods involving some model dependency.

[b] Seq.(A): Yrast sequence.

[c] Seq.(B): γ cascade based on (7$^+$).

$\gamma(^{50}Ti)$ (continued)

E_i(level)	J^{π}_i	E_γ[†]	I_γ[†]	E_f	J^{π}_f	Mult.[a]	δ	α[e]	Comments
1553.794	2^+	1553.768[‡] *8*	100	0.0	0^+	E2			B(E2)(W.u.)=5.46 *19* Mult.: ΔJ=2, Q from DCO in (^{9}Be,3nαγ); M2 ruled out by RUL.
2674.932	4^+	1121.124[‡] *5*	100	1553.794	2^+	E2			B(E2)(W.u.)=5.5 *+15−10* Mult.: Q from γ(DCO) in (^{9}Be,3nαγ); M2 ruled out by RUL.
3198.730	6^+	523.792[‡] *18*	100	2674.932	4^+	E2			B(E2)(W.u.)=3.14 *13* Mult.: stretched Q from γ(θ) in (α,2nγ) and γ(DCO) in (^{9}Be,3nαγ), M2 ruled out by RUL.
3862.81	$(2,3)^+$	2308.98 *4*	100	1553.794	2^+				
3868.3	0^+	2314.4 *20*	100	1553.794	2^+	(E2)[b]			B(E2)(W.u.)=1.6 *+14−5* E_γ: from (t,pγ).
3974.9?		1300.0[#f] *10*	100	2674.932	4^+				
4147.210	4^+	1472.255 *8*	100	2674.932	4^+	D,E2			
4172.003	3^+	1497.054 *25*	48 *3*	2674.932	4^+				
		2618.33 *7*	100 *6*	1553.794	2^+				
4172.8	(2^+)	2618.6[@] *4*	100	1553.794	2^+	D,E2			
4309.86	2^+	2755.89 *13*	100 *10*	1553.794	2^+	M1+E2	−0.26 *17*		B(M1)(W.u.)=0.135 *+49−37*; B(E2)(W.u.)=2.8 *+61−25* Mult.,δ: from pγ(θ) in (t,pγ) and comparison to RUL.
		4309.74 *20*	19.6 *21*	0.0	0^+	[E2]		1.29×10^{-3}	B(E2)(W.u.)=0.93 *+45−28* α(K)=7.37×10^{-6} *11*; α(L)=6.55×10^{-7} *10*; α(M)=8.38×10^{-8} *12* α(N)=4.57×10^{-9} *7*; α(IPF)=0.001278 *18*
4410.02	3^-	1735.00 *5*	25.5 *17*	2674.932	4^+				
		2856.13 *4*	100 *7*	1553.794	2^+				
4486.74	(2^+)	2933.27 *12*	100 *10*	1553.794	2^+				
		4486.0 *4*	17 *3*	0.0	0^+				
4789.97	2^+	3236.09 *7*	100 *7*	1553.794	2^+	D,E2			
		4789.3 *4*	11.3 *19*	0.0	0^+	(E2)[b]		1.43×10^{-3}	α(K)=6.34×10^{-6} *9*; α(L)=5.63×10^{-7} *8*; α(M)=7.20×10^{-8} *10* α(N)=3.93×10^{-9} *6*; α(IPF)=0.001428 *20*
4880.705	5^+	733.69 *9*	2.12 *20*	4147.210	4^+	D,E2			
		1681.69 *15*	8.3[&] *24*	3198.730	6^+	D,E2			
		2205.722 *13*	100[&] *6*	2674.932	4^+	D,E2			
5186.103	$(3,4)^+$	1039[@f] *1*	<6[@]	4147.210	4^+	D,E2			
		2511.110 *22*	100 *7*	2674.932	4^+	D,E2			
		3632.10 *5*	40.4 *24*	1553.794	2^+	D,E2			
5379.942	4^+	1207.930 *12*	54.8 *31*	4172.003	3^+	D,E2			
		2704.92 *4*	100[&] *7*	2674.932	4^+	D,E2			
		3826.08 *11*	12.8[&] *10*	1553.794	2^+	(E2)[b]		1.12×10^{-3}	B(E2)(W.u.)=0.15 *+7−5*

γ(^{50}Ti) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[a]	δ	Comments
								α(K)=8.78×10^{-6} *13*; α(L)=7.80×10^{-7} *11*; α(M)=9.98×10^{-8} *14* α(N)=5.45×10^{-9} *8*; α(IPF)=0.001110 *16*
5440.74	4$^+$,5$^+$	2765.73[‡] *20*	100	2674.932	4$^+$			
5547.81	(4$^+$)	2348.3[f] *3*	27 *6*	3198.730	6$^+$			
		2872.72 *10*	100 *8*	2674.932	4$^+$			
		3993.87 *5*	82 *5*	1553.794	2$^+$			
5694.87	2$^+$,3$^+$	3019.86 *11*	100	2674.932	4$^+$			
5806.54	4$^+$,5$^+$	3131.71 *19*	100	2674.932	4$^+$			
5837.2	(2 to 5)$^{(+)}$	1690.0[@] *7*	100[@]	4147.210	4$^+$	D,E2		
		3162[@] *1*	82[@]	2674.932	4$^+$	D,E2		
5946.479	3$^+$,4$^+$	760.31 *8*	8.9 *9*	5186.103	(3,4)$^+$	(M1)		B(M1)(W.u.)=0.18 *+12−7* Mult.: dipole from comparison to RUL. $\Delta\pi$=no from level scheme. δ: ≤0.037 *6*.
		1156.65 *16*	5.2 *8*	4789.97	2$^+$	D,E2		
		1799[@][f] *1*	≈14[@]	4147.210	4$^+$	D,E2		
		3271.41 *3*	100 *6*	2674.932	4$^+$	D,E2		
6123.15	(4$^+$)	1242.38 *4*	100 *7*	4880.705	5$^+$	D,E2		
		1636.45 *5*	85 *6*	4486.74	(2$^+$)	(E2)[b]		
		1975.8[@][f] *6*	<15[@]	4147.210	4$^+$			
		2924.9 *5*	31 *7*	3198.730	6$^+$	(E2)[b]		
		3448.4 *5*	20 *5*	2674.932	4$^+$	D,E2		
6136.3	(7)$^+$	2937.5 *6*	100	3198.730	6$^+$	M1+E2[c]	−0.141[c] *25*	E_γ: weighted average of 2938.0 *7* from (^{46}Ar,5nγ), 2936.4 *16* from (α,2nγ), and 2935.5 *20* from (^{9}Be,3n$\alpha\gamma$).
6156.47	(2,3,4$^+$)	4602.50 *25*	100	1553.794	2$^+$			
6301.81	(1,2,3)$^-$	2128.4 *5*	15 *5*	4172.8	(2$^+$)			
		4747.73 *7*	100 *6*	1553.794	2$^+$			
6379.88	(5)$^-$	1498.8[@][f] *4*	117[@]	4880.705	5$^+$			
		2232.3[@][f] *7*	117[@]	4147.210	4$^+$			
		3181.9 *6*	100 *32*	3198.730	6$^+$			
6399.81	(3)$^-$	3724.1 *5*	65 *15*	2674.932	4$^+$			
		4845.6 *3*	100 *11*	1553.794	2$^+$			
6481.2	3$^+$	2309.1[@] *4*	100	4172.003	3$^+$	D,E2		
6521.41	3$^+$,4$^+$	1730.8 *3*	22 *6*	4789.97	2$^+$	D,E2		
		2348.5[@] *7*	21[@]	4172.8	(2$^+$)	D,E2		
		2373.3[@][f] *6*	21[@]	4147.210	4$^+$	D,E2		
		2658.75 *20*	47 *7*	3862.81	(2,3)$^+$	D,E2		
		3846.18 *11*	100 *9*	2674.932	4$^+$	D,E2		

γ(^{50}Ti) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[a]	δ	α[e]	Comments
6540.7	(8)$^+$	404.4 *4*	100	6136.3	(7)$^+$	M1+E2[c]	−0.017[c] *9*		E_γ: weighted average of 404.4 *4* from (^{46}Ar,5nγ) and 404.5 *7* from (α,2nγ),
6710.570	4$^+$	1524.53 *4*	64 *5*	5186.103	(3,4)$^+$	D,E2			
		2300.43 *5*	62 *5*	4410.02	3$^-$	(E1)			B(E1)(W.u.)=0.0008 *+8−3* Mult.: dipole from comparison to RUL. $\Delta\pi$=no from level scheme.
		2538.37 *10*	100 *10*	4172.003	3$^+$	D,E2			
		5156.46 *7*	78 *5*	1553.794	2$^+$	(E2)[b]		1.54×10^{-3}	B(E2)(W.u.)=0.33 *+35−13* α(K)=5.72×10^{-6} *8*; α(L)=5.08×10^{-7} *8*; α(M)=6.50×10^{-8} *9* α(N)=3.55×10^{-9} *5*; α(IPF)=0.001529 *22*
6729.86	3$^-$	2867.39 *21*	85 *11*	3862.81	(2,3)$^+$				
		4054.75 *11*	100 *8*	2674.932	4$^+$				
6770.5	(9)$^+$	229.8 *4*	100	6540.7	(8)$^+$	M1+E2[c]	−0.035[c] *15*	0.00233	α(K)=0.00211 *4*; α(L)=0.000192 *3*; α(M)=2.45×10^{-5} *4* α(N)=1.317×10^{-6} *21* E_γ: weighted average of 230.39 *30* from (^{46}Ar,5nγ), 229.6 *7* from (α,2nγ), and 229.3 *3* from (^{9}Be,3n$\alpha\gamma$).
6837.64	(2$^+$,3,4$^+$)	1457.6 *3*	33 *7*	5379.942	4$^+$				
		5283.39 *14*	100 *6*	1553.794	2$^+$				
6849.05	(5)$^-$	2700.6 *6*	100 *32*	4147.210	4$^+$				
		3649.9 *5*	69 *20*	3198.730	6$^+$				
7029.39	2$^+$,3$^+$,4$^+$	2719.1 *3*	100	4309.86	2$^+$				
7078.72	(3)$^-$	4402.1 *5*	100 *23*	2674.932	4$^+$				
		5525.5 *5*	90 *19*	1553.794	2$^+$				
7232.19	(2)$^+$	1852.9 *4*	100 *32*	5379.942	4$^+$				
		5677.8 *3*	30 *5*	1553.794	2$^+$				
7482.96	(2)$^+$	5929.14 *15*	100	1553.794	2$^+$				
7539.5?		770.2[#f] *10*	100[#]	6770.5	(9)$^+$				
7572.6	(10)$^+$	802.1 *7*	100	6770.5	(9)$^+$	M1+E2[c]	−0.044[c] *18*		E_γ: unweighted average of 803.4 *4* from (^{46}Ar,5nγ), 801.3 *6* from (α,2nγ), and 801.5 *6* from (^{9}Be,3n$\alpha\gamma$).
8257.7?		1718.0[#f] *15*	100	6540.7	(8)$^+$				
8793.7	(11$^+$)	1221.1 *13*	100	7572.6	(10)$^+$	(M1+E2)[c]	−0.17[c] *10*		E_γ: unweighted average of 1223.7 *11* from (^{46}Ar,5nγ), 1219.8 *10* from (α,2nγ), and 1219.9 *10* from (^{9}Be,3n$\alpha\gamma$).
(10939.184)	3$^-$,4$^-$	3456.17[d] *7*	5.79[d] *22*	7482.96	(2)$^+$				
		3707.4[d] *6*	3.4[d] *23*	7232.19	(2)$^+$				

$^{50}_{22}$Ti$_{28}$-14

Adopted Levels, Gammas (continued)

$\gamma(^{50}Ti)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[a]
(10939.184)	$3^-,4^-$	3860.1[d] *3*	1.12[d] *17*	7078.72	$(3)^-$	
		3909.0[d] *4*	0.79[d] *13*	7029.39	$2^+,3^+,4^+$	
		4089.93[d] *8*	4.44[d] *17*	6849.05	$(5)^-$	
		4101.32[d] *7*	4.72[d] *17*	6837.64	$(2^+,3,4^+)$	
		4209.17[d] *6*	5.62[d] *17*	6729.86	3^-	
		4228.43[d] *3*	22.5[d] *4*	6710.570	4^+	
		4417.55[d] *4*	10.34[d] *22*	6521.41	$3^+,4^+$	
		4539.01[d] *18*	1.67[d] *12*	6399.81	$(3)^-$	
		4559.13[d] *14*	3.03[d] *17*	6379.88	$(5)^-$	
		4637.13[d] *4*	10.28[d] *22*	6301.81	$(1,2,3)^-$	
		4782.6[d] *4*	0.79[d] *12*	6156.47	$(2,3,4^+)$	
		4815.79[d] *6*	6.01[d] *17*	6123.15	(4^+)	
		4992.420[d] *25*	25.2[d] *4*	5946.479	$3^+,4^+$	
		5132.72[d] *25*	1.13[d] *11*	5806.54	$4^+,5^+$	
		5244.04[d] *10*	3.07[d] *12*	5694.87	$2^+,3^+$	
		5391.07[d] *5*	11.01[d] *22*	5547.81	(4^+)	
		5558.937[d] *24*	34.5[d] *5*	5379.942	4^+	
		5752.692[d] *24*	26.5[d] *3*	5186.103	$(3,4)^+$	
		6058.105[d] *20*	56.4[d] *6*	4880.705	5^+	
		6148.85[d] *14*	2.98[d] *17*	4789.97	2^+	
		6451.6[d] *5*	1.40[d] *22*	4486.74	(2^+)	
		6528.72[d] *10*	5.17[d] *17*	4410.02	3^-	
		6766.73[d] *5*	100.0[d] *17*	4172.003	3^+	
		6791.41[d] *7*	42.6[d] *11*	4147.210	4^+	
		8263.51[d] *3*	48.2[d] *6*	2674.932	4^+	D
		9384.41[d] *6*	28.5[d] *4*	1553.794	2^+	D

† From (n,γ), except as noted. 2.6 ppm (Eγ<1.8 MeV) and 3.2 ppm (Eγ>1.8 MeV) systematic uncertainty in Eγ added in quadrature. 5% systematic uncertainty in Iγ added in quadrature.

‡ From ^{50}Sc β^- decay. Other precise Eγ=1553.785 *6*, 1121.130 *6*, and Eγ=523.759 *10* (plus 2.6 ppm systematic uncertainty) from (n,γ).

\# From (α,2nγ).

@ From (d,pγ).

$^{50}_{22}Ti_{28}$-15

$\gamma(^{50}Ti)$ (continued)

[&] 4881 state: Iγ(1682)/Iγ(2206)=0.220 *24* in ^{50}Sc β^- decay, 0.083 *23* in (n,γ), and 0.13 in (d,pγ) are discrepant. 5380 state: Iγ(3826)/Iγ(2705)=0.42 *12* in ^{50}Sc β^- decay is discrepant with 0.128 *9* in (n,γ); 3826γ not observed in (d,pγ).

[a] The assignment of Mult=D,E2 where given are from measured $T_{1/2}$ and γ branchings compared with RUL.

[b] D,E2 from comparison to RUL; ΔJ=2 from level scheme.

[c] From $\gamma(\theta)$, $\gamma\gamma(\theta)$(DCO), and $\gamma\gamma$ linear polarization in (α,2nγ).

[d] Primary γ from (n,γ) E=thermal.

[e] 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.

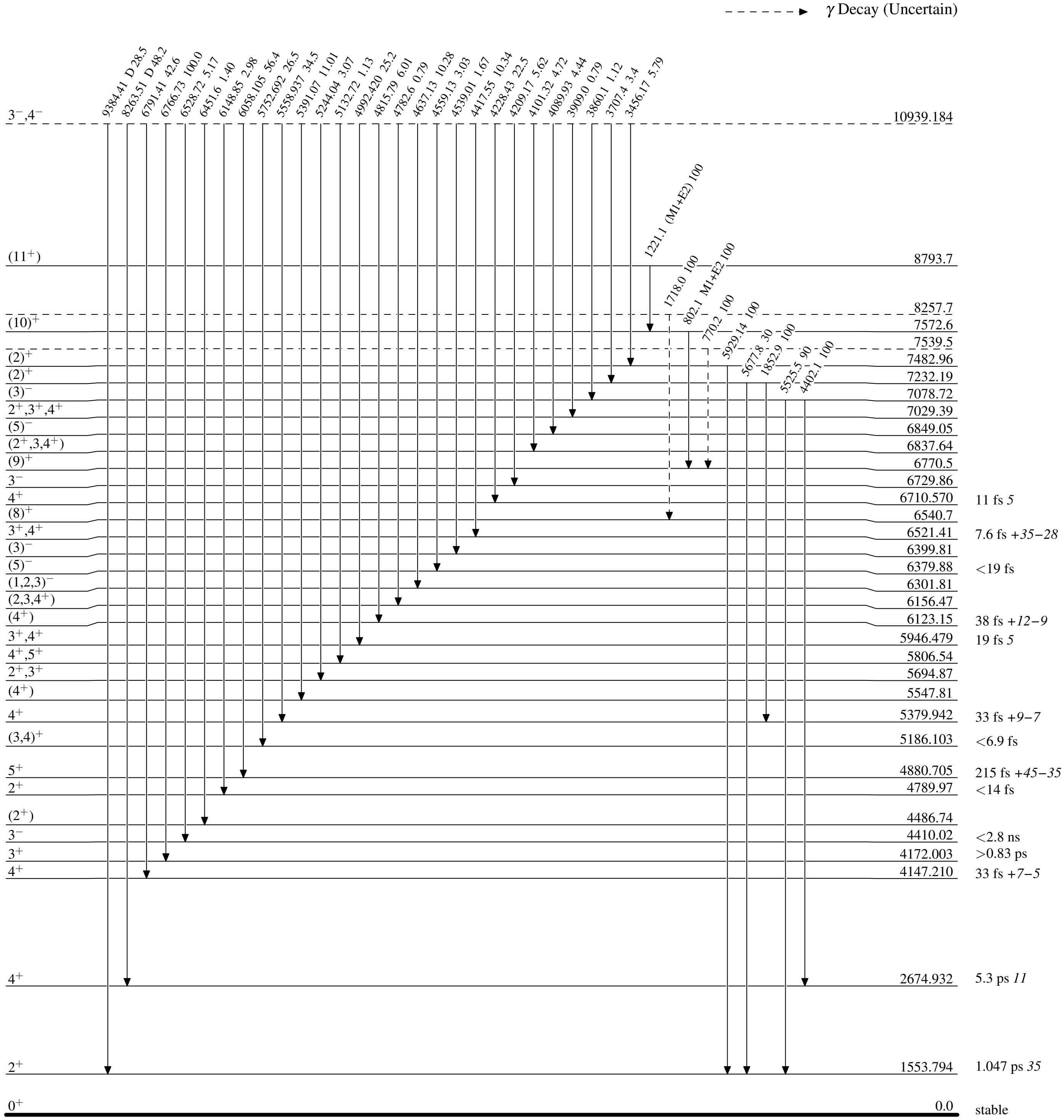
[f] Placement of transition in the level scheme is uncertain.

$^{50}_{22}Ti_{28}$-16

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{50}_{22}Ti_{28}$

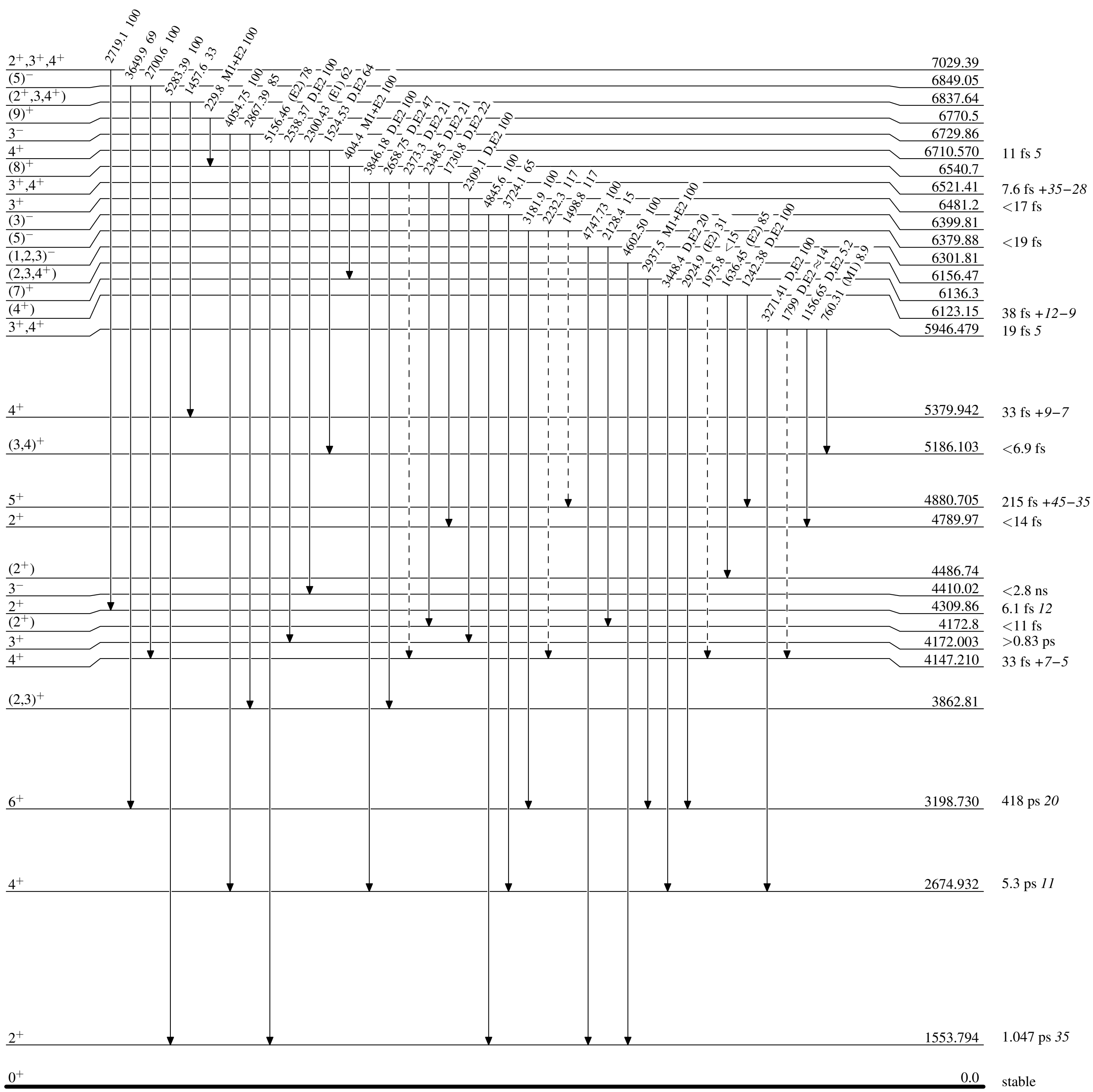
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{50}_{22}Ti_{28}$

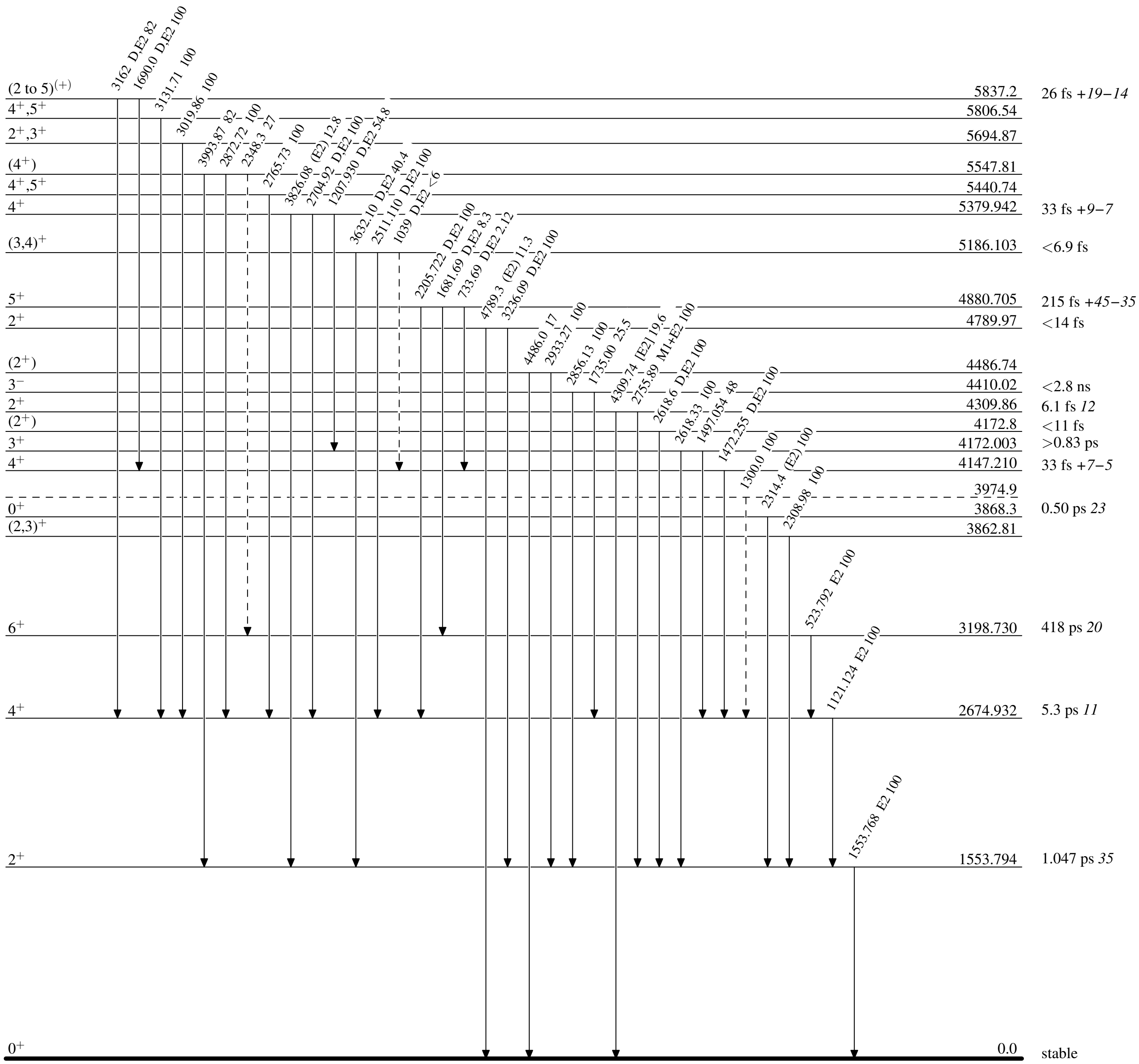
Adopted Levels, Gammas

Legend

Level Scheme (continued)

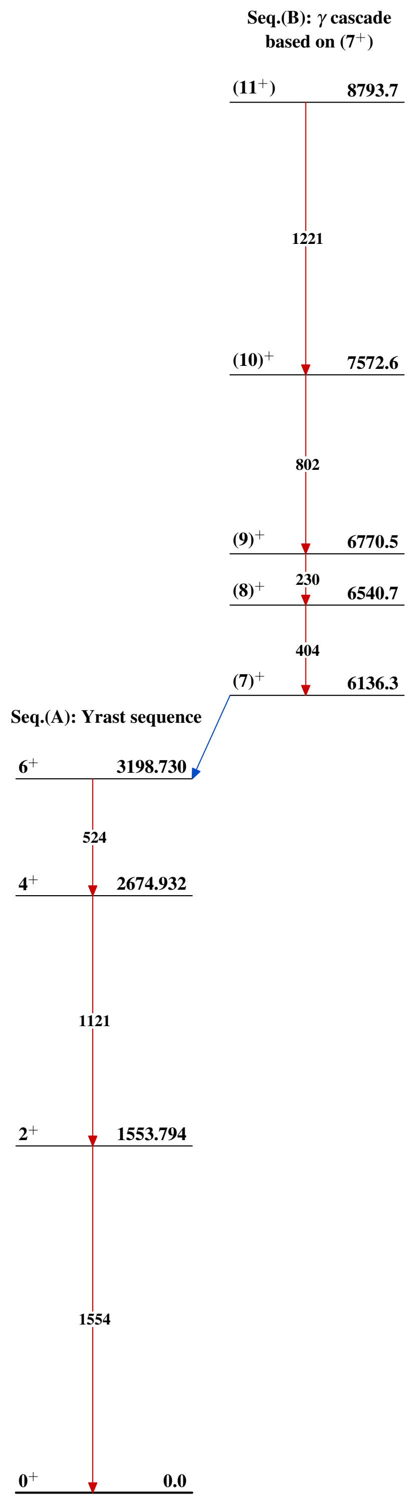
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{50}_{22}Ti_{28}$

Adopted Levels, Gammas



$^{50}_{22}Ti_{28}$