

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 179, 1 (2022)	30-Nov-2021

$Q(\beta^-) = -4014.9$ 10; $S(n) = 11626.66$ 3; $S(p) = 11445.1$ 19; $Q(\alpha) = -9449.1$ 3 [2021Wa16](#)

$S(2n) = 20507.32$ 6, $S(2p) = 19931.3$ 22 ([2021Wa16](#)).

Mass measurements: [2017Ka53](#), [2014Kw04](#), [2013Bu12](#), [2012Na15](#), [1979Ko10](#), [1972De39](#).

Measurements of hyperfine structure: [2004Ga34](#), [2002Ca47](#), [1996Fu23](#), [1996Lu12](#), [1995Ga44](#), [1994An35](#), [1994GaZZ](#), [1994Lu18](#), [1992Az03](#).

 ^{48}Ti Levels

$B(M1)\uparrow$, $B(E2)\uparrow$ and $B(M3)\uparrow$ under comments are from model-independent PWBA in (e,e'), unless otherwise noted.

Cross Reference (XREF) Flags

A $^{48}\text{Sc} \beta^-$ decay	M $^{47}\text{Ti}(d,p)$	Y $^{48}\text{Ti}(\alpha, \alpha')$
B $^{48}\text{V} \varepsilon$ decay	N $^{48}\text{Ca}(\pi^+, \pi^-)$	Z $^{49}\text{Ti}(p,d)$
C $^{48}\text{Ca} 2\beta^-$ decay	O $^{48}\text{Ca}(^3\text{He}, 3n\gamma)$	Others:
D $^9\text{Be}(^{49}\text{V}, X\gamma)$	P $^{48}\text{Ti}(\gamma, \gamma), (\gamma, \gamma')$	AA $^{49}\text{Ti}(d,t)$
E $^{27}\text{Al}(^{24}\text{Mg}, 3p\gamma)$	Q $^{48}\text{Ti}(e, e')$	AB $^{49}\text{Ti}(^3\text{He}, \alpha)$
F $^{36}\text{S}(^{14}\text{C}, 2n\gamma)$	R $^{48}\text{Ti}(\pi^+, \pi^{+'}), (\pi^-, \pi^{-'})$	AC $^{50}\text{Ti}(p,t)$
G $^{44}\text{Ca}(^6\text{Li}, d), ^{52}\text{Cr}(d, ^6\text{Li})$	S $^{48}\text{Ti}(n, n')$	AD $^{50}\text{V}(d, \alpha)$
H $^{44}\text{Ca}(^7\text{Li}, p2n\gamma)$	T $^{48}\text{Ti}(n, n'\gamma)$	AE $^{50}\text{Cr}(^{14}\text{C}, ^{16}\text{O})$
I $^{45}\text{Sc}(\alpha, p)$	U $^{48}\text{Ti}(p, p'), (\text{pol } p, p')$	AF $^{51}\text{V}(p, \alpha)$
J $^{45}\text{Sc}(\alpha, p\gamma)$	V $^{48}\text{Ti}(p, p'\gamma)$	AG Coulomb excitation
K $^{46}\text{Ti}(t, p)$	W $^{48}\text{Ti}(d, d'), (\text{pol } d, d')$	AH Inelastic scattering; giant res
L $^{47}\text{Ti}(n, \gamma)$ E=thermal	X $^{48}\text{Ti}(^3\text{He}, ^3\text{He}')$	

E(level) [†]	J ^π	T _{1/2} [@]	XREF	Comments
0.0	0 ⁺	stable	AB DEFGHIJKLMNOPQR TUVWXYZ	XREF: Others: AA , AB , AC , AD , AE , AF , AG Nuclear rms charge radius=3.5921 fm 17 (2013An02).
983.531 4	2 ⁺	4.5 ps 4	AB DEFGHIJKLM OPQRSTUVWXYZ	XREF: Others: AA , AB , AC , AD , AE , AF , AG $\mu = +0.78$ 4 (2000Er06); $Q = -0.177$ 8 (1972Li12) XREF: AB (1000). J^π : $L(p,t) = L(\alpha, \alpha') = 2$ from 0 ⁺ . $T_{1/2}$: weighted average of 4.64 ps 42 (1981Ca10), 4.9 ps 15 (1963Ak03), and 4.2 ps 14 (1958Kn36) from Γ in (γ, γ) ; 2.9 ps +21-13 (1973Ba02) from DASM in $(p, p'\gamma)$; 3.95 ps 61 (2000Er01), 4.16 ps 90 (1973Ba02), 3.67 ps 56 (1972WaYZ), and 5.75 ps 89 (1973Fi15) from DSAM in Coulomb excitation, and 5.0 ps 5 from adopted $B(E2)\uparrow = 0.061$ 6 below. Other: 4.90 ps +22-21 from $B(E2)$ evaluation by 2016Pr01 using the same data, with its difference from the adopted value here due to the fact that 2016Pr01 does not take into account the additional systematic uncertainty from the stopping power theory in DSAM for values in 1973Fi15 and 2000Er01 in Coulomb excitation (see details in this dataset), which take up most of the weight in their weighted average. μ : from Transient Fields method (2000Er06). Others: +0.9 4 (1981Sh19 , TF). Q : from electron scattering (1972Li12). Others: -0.38 13 (1971De29), -0.22 8 (1970Ha24), and -0.135 eb 88 (1972Le19) from Coulomb excitation. See also 2016St14

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF								Comments
2295.648 7	4 ⁺	0.87 ps 13	AB	DEFGHIJ	LM	OP	R	TUVW	YZ		compilation. B(E2)↑=0.0613 56, unweighted average of 0.0537 36 in (e,e'), 0.050 15 in (p,p'), 0.0694 52 in (π⁺,π⁻), 0.072 4 in Coulomb excitation. Other: 0.0069 from (α,α') (1970Br07) is discrepant, lower than other values by one order of magnitude. XREF: Others: AA, AB, AC, AD, AF, AG μ=+2.2 5 (2000Er06) XREF: R(2400)AB(2310). J^π: L(p,t)=(α,α')=4 from 0⁺. T_{1/2}: weighted average of 0.97 ps 35 from DSAM in (α,pγ), 1.4 ps +6-5 from (γ,γ), 1.5 ps 8 from DSAM in (n,n'γ), and 0.76 ps 13 (2000Er01) and 1.66 ps 42 (1973Ba02) from DSAM Coulomb excitation.
2421.053 10	2 ⁺	30.4 fs 23	BCD	IJ	LM	PQR	TUVW	YZ			μ: from Transient Fields method (2000Er06). XREF: Others: AA, AC, AD, AF, AG J^π: L(α,α')=L(p,t)=2 from 0⁺. T_{1/2}: weighted average of 42 fs 14 (1979Gl07) and 30 fs 6 (1978Li13) in (α,pγ), 13.9 fs 28 (1993Ko57), 28 fs 12 (1989Ge05) and 31.9 fs 21 (1993BeZL) in (n,n'γ), 11 fs +7-11 (1969Ka10), 24 fs 5 (1973Ba02) and 19 fs +11-9 (1978DeYT) in (p,p'γ), and 51 fs 9 (2000Er06) in Coulomb excitation, all from DSAM. Others: 33 fs +16-9 from Γ in (γ,γ') and 35 fs +7-5 from adopted B(E2)↑ below, both depending on the adopted branching ratio of 2421γ. Averaging all values above gives a value of 30.8 fs 21, with a reduced χ²=1.5.
2465 5									U		
2997.31 17	0 ⁺	80 fs 14		ijkl		Q	TUVWxy				XREF: Others: AA, AC, AF J^π: L(t,p)=L(p,t)=0 from 0⁺. T_{1/2}: weighted average of 64 fs 11 (1989Ge05) in (n,n'γ), 87 fs 21 (1969Ka10), 111 fs 22 (1973Ba02) and 194 fs +76-49 (1978DeYT) in (p,p'γ), all from DSAM.
3062 5	2 ⁺					Q	U				XREF: Q(3017). E(level): from (p,p'). Other: 3017 from (e,e'). J^π: from PWBA analysis of σ(θ) in (e,e').
3223.971 9	3 ⁺	33 fs 6	B D	ij	LM	Q	TUV	z			B(E2)↑=0.00112 20 (1990Gu09) from (e,e'). XREF: Others: AA, AD, AF XREF: Q(3239)U(3230). J^π: spin=3 from pγ(θ) in (p,p'γ); 2240.4γ M1+E2 to 2⁺. T_{1/2}: weighted average of 54 fs 17 (1979Gl07) and 39 fs 6 (1978Li13) in (α,pγ), 29 fs 18 (1993Ko57) in (n,n'γ), 17 fs +9-11 (1969Ka10), 29 fs +13-10 (1973Ba02) and 31 fs +14-12 (1978DeYT) in (p,pγ), all from DSAM.
3239.771 13	4 ⁺	46 fs 11	B D	G ij	L		R	TUVW	Yz		B(M3)↑=0.50 10 (1990Gu09) in (e,e'). XREF: Others: AA, AC, AD, AF XREF: G(3200). J^π: L(α,α')=L(p,t)=4 from 0⁺. T_{1/2}: weighted average of 49 fs 14 (1979Gl07) in (α,pγ), 50 fs 11 (1993Ko57) in (n,n'γ), 69 fs +37-29 (1969Ka10), 30 fs +14-11 (1973Ba02), and 62 fs +28-21 (1978DeYT) in (p,p'γ), all from DSAM.
3333.187 13	6 ⁺	8.9 ps 8	A	DEFGHIJ	LM	O		T V	YZ		XREF: Others: AA, AB, AC, AD, AF XREF: G(3400)V(?). J^π: L(α,α')=L(p,t)=6 from 0⁺.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

<u>E(level)[†]</u>	<u>J^π</u>	<u>T_{1/2}[@]</u>	<u>XREF</u>	<u>Comments</u>
3358.823 17	3 ⁻	186 fs +38-34	B D IJ L qr TUVW Y	T_{1/2}: from RDM by 1974Br04 in (α,py). Others: >3.5 ps (1979Gl07), >1.3 ps (1978Li13), from DSAM in (α,py); >7 ps from DSAM by 1993Ko57 in (n,n'γ); 221 fs +48-44 from DSAM by 1969Ka10 in (p,p'γ) is strongly discrepant with other values. XREF: Others: AA, AD, AF XREF: q(3374). J^π: L(p,p')=3 from 0⁺; L(d,t)=0 from 7/2⁻; 2375.2γ D(+Q) to 2⁺. T_{1/2}: weighted average of 198 fs +80-70 (1979Gl07) in (α,py), 173 fs +38-34 (1969Ka10), 243 fs 62 (1973Ba02), and 173 fs +55-42 (1978DeYT) in (p,p'γ), and 180 fs 56 (1993Ko57) in (n,n'γ), all from DSAM. B(E3)↑=0.0080 16 from model-dependent analysis in (e,e').
3370.87 3	2 ⁺	11.2 fs 14	J LM Pqr TUVW Y	XREF: Others: AA, AC, AD, AF XREF: AC(3363). J^π: spin=2 from py(θ) in (p,p'γ); L(d,p)=1+3 from 5/2⁻. T_{1/2}: weighted average of 13.2 fs 14 (1993BeZL) and 9.0 fs 14 (1989Ge05) in (n,n'γ), 15 fs 9 (1969Ka10) and 12 fs 5 (1973Ba02) in (p,p'γ), all from DSAM. Others: 30 fs +13-9 (1978DeYT) in (p,p'γ) and 29.1 fs 56 (1993Ko57) in (n,n'γ) are discrepant; 12.5 fs +35-27 from Γ in (γ,γ') and 12.7 fs +31-23 from B(E2)↑ in (e,e'), both depending on the adopted branching ratio of 3371γ. Averaging all values above gives 12.0 fs 14, with a reduced χ²=2.5.
3508.548 12	6 ⁺	1.9 ps 5	A DEFgHIJ M O TU YZ	XREF: Others: AA, AC, AD, AF XREF: g(3400). J^π: L(α,α')=L(p,t)=6 from 0⁺. T_{1/2}: deduced by the evaluator from 1.4 ps<T_{1/2}<2.4 ps, with lower limit from DSAM by 1979Gl07 and upper limit from RDM by 1974Br04 in (α,py). Other: 0.9 ps +5-3 from DSAM by 1978Li13 in (α,py), but it is inconsistent with T_{1/2}>1 ps from RUL of 176γ assuming Mult(176γ)=M1.
3616.812 21	2 ⁺	43 fs 13	IJKLM QR TUV Y	XREF: Others: AA, AC, AD, AF XREF: AF(3631). J^π: L(α,α')=L(p,t)=2 from 0⁺. T_{1/2}: weighted average of 38 fs 13 (1979Gl07) from (α,py) and 53 fs +21-14 (1978DeYT) from (p,p'γ), both from DSAM. Others: 8.3 fs 28 (1989Ge05) from DSAM in (n,n'γ) and 10.3 fs 26 (1969Ka10) from DSAM in (p,p'γ) are discrepant.
3699.52 8	1 ⁽⁻⁾	11.3 fs 21	J Lm PQ TuV	XREF: Others: AD, AF J^π: spin=1 from py(θ) in (p,p'γ); 1⁻ from model-dependent analysis of measured form factors by 1989Gu17 in (e,e'); π=- tentatively assigned by 1990De20 based on measured γ(θ) and azimuthal asymmetries; π=- is also supported by the 3703γ feeding from the 5643, 3⁻ level. But π=+ from 2715.8γ M1+E2 to 2⁺ in (p,p'γ) (1968Mo20) is discrepant. Other: 1⁺ assigned by 1993Ko57 in (n,n'γ). T_{1/2}: from DSAM in (n,n'γ). Other: 6.1 fs +16-12 from Γ in (γ,γ') and adopted branching ratio of 3699γ; 24 fs 4 from DSAM in (p,p'γ) is discrepant.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF				Comments
3711.6? 10			J	m		u	XREF: Others: AD , AF
3738.60 11	1 ⁺ $\frac{3}{2}^+$	3.1 fs 18	IJ	LM	PQ	TUV	XREF: Others: AA , AC , AD , AF XREF: I(?). J ^π : 3738.4γ M1 to 0 ⁺ . T _{1/2} : from DSAM in (n,n'γ). Other: 3.1 fs +9-7 from Γ in (γ,γ) and the adopted branching ratio of 3738γ; <1.4 fs from DSAM in (α,pγ); 112 fs (1978DeYT) and 11 fs 3 (1969Ka10) from DSAM in (p,p'γ) are discrepant.
3782.459 18	3 ⁻ ,4 ⁻	1.2 ps +11-6	D	IJ LM		TuV	XREF: Others: AA , AD J ^π : L(d,t)=0 from 7/2 ⁻ . T _{1/2} : other: 50 fs from DSAM in (p,p'γ) is discrepant.
3802.73 11	2 ⁻			L		Q	XREF: Others: AD , AF XREF: Q(3787)AF(3797). J ^π : from model-independent PWBA analysis in (e,e') (1990Gu09).
3850.9? 10	0 ⁺						XREF: Others: AC J ^π : L(p,t)=0.
3852.24 4	3 ⁻	32 fs 6	D	IJ LM	QR	TUV Y	XREF: Others: AA , AD , AF XREF: I(3842)Q(3871)R(3870)AF(3868). J ^π : L(α,α')=L(p,p')=3 from 0 ⁺ . T _{1/2} : weighted average of 48 fs 14 (1979Gl07) and 27 fs 6 (1978Li13) in (α,pγ), 97 fs 66 in (n,n'γ), 39 fs +14-11 in (p,p'γ), all from DSAM.
4035.153 15	2 ⁺	22 fs 13		iJKLM		r T V Y	XREF: Others: AA , AC , AD XREF: i(4050)r(4050)T(?)Y(4045)AC(4044). J ^π : L(α,α')=L(p,t)=2 from 0 ⁺ . T _{1/2} : other: 26 fs +28-21 from DSAM in (p,p'γ).
4046.6 3	5 ⁽⁻⁾	0.37 ps 11	D	iJ		U z	XREF: Others: AD XREF: i(4050)z(4060). J ^π : spin=5 from pγ(θ) in (α,pγ) (1979Gl07); π=- proposed by 1989Hi05 in (p,p'), but no σ(θ) or analyzing power data given.
4074.511 21	2 ⁺	35 fs 11		J Lm		r tu Yz	T _{1/2} : from DSAM in (α,pγ). XREF: Others: AA , AB , AD XREF: r(4050)z(4060)ab(4060). J ^π : L(α,α')=2 from 0 ⁺ .
4077 3	4 ⁺		G	m		tu z	XREF: Others: AA , AB , AC , AD XREF: G(4200)z(4060)ab(4060). E(level): from (p,t). J ^π : from L(p,t)=4 from 0 ⁺ .
4102	1 ⁺					Q	XREF: Others: AD J ^π : from model-independent analysis of measured σ(θ) in (e,e') (1990Gu09). B(M1)†=0.17 7 (1990Gu09) in (e,e').
4157 5			g			r U	XREF: g(4200)r(4170). E(level): from (p,p').
4196.90 3	(2 ⁺)			J Lm		r	XREF: r(4170). J ^π : 4196.6γ to 0 ⁺ , possible 346γ to 3 ⁻ .
4204.9 5	(1,2 ⁺)			Lm		r U	XREF: Others: AD XREF: r(4170)ad(4212). J ^π : 4204.7γ to 0 ⁺ .
4210 8	2 ⁻			m	Q	T	XREF: Others: AD XREF: ad(4212). J ^π : from model-independent analysis of measured σ(θ) in (e,e') (1990Gu09).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

⁴⁸ Ti Levels (continued)						
E(level) [†]	J ^π	T _{1/2} [@]	XREF			Comments
4254.5 10	1 ⁺		JK	Q	U	J ^π : from model-independent analysis of measured $\sigma(\theta)$ in (e,e') (1990Gu09). B(M1)↑=0.14 10 (1990Gu09) in (e,e').
4311.3 5	1 ⁺ [‡]	3.8 fs +39–17	J	M	P TU	XREF: Others: AD XREF: T(?)AD(4328). J ^π : 4310γ M1 to 0 ⁺ .
4346.7 6	(2 ⁺)		J	M	r TU	T _{1/2} : from $\Gamma_{\gamma 0}^2/\Gamma$ in (γ,γ') and adopted branching ratio of 4310γ. XREF: Others: AD XREF: r(4390)AD(4358).
4381.4 3	(3,4,5 ⁻)	25 fs 14	ijk m	r T	yz	J ^π : proposed in (pol p,p') (1989Hi05), but no $\sigma(\theta)$ or analyzing power given. XREF: Others: AA, AB XREF: i(4390)r(4390)aa(4383).
4387.691 20	4 ⁺	37 fs 14	ijkLm	r TU	yz	J ^π : 1142.3γ to 4 ⁺ can not be pure E2 (ΔJ=2) from comparison with RUL; 1261γ from 3 ⁻ . T _{1/2} : weighted average of 21 fs 14 from (α,py) and 28 fs 14 from (n,n'γ), using DSAM. XREF: Others: AA, AB, AC XREF: i(4390)U(4392)aa(4383)AC(4393).
4398.7 4	6 ⁺	45 fs 14	ij			J ^π : L(α,α')=(p,t)=4 from 0 ⁺ . T _{1/2} : weighted average of 35 fs 14 from (α,py) and 55 fs +49–28 from (n,n'γ), using DSAM. XREF: Others: AA, AD XREF: i(4390)aa(4402)ad(4402).
4404.8 4	5 ⁽⁺⁾	<42 fs	ij		z	J ^π : spin=6 from py(θ) in (α,py); 2103γ to 4 ⁺ can not be M2 from comparison with RUL. XREF: Others: AA, AD XREF: i(4390)aa(4402)ad(4402).
4407	(2 ⁺)		i		Y	J ^π : spin=5 from py(θ) in (α,py); parity=+ for a group at 4390 in (α,p). XREF: Others: AA, AD XREF: i(4390)aa(4402)AD(4417).
4457.455 11	3 ⁺	49 fs 24	G J LM			E(level): from (α,α'). Other: 4417 12 from (d,α). J ^π : L(α,α')=(2) from 0 ⁺ . XREF: Others: AA, AD XREF: G(4500)ad(4472).
4472 5	3 ⁻				U	J ^π : spin=3 from nuclear orientation and circular polarization in (n,γ) E=thermal; parity=+ from L(d,p)=1 from 5/2 ⁻ . XREF: Others: AD XREF: ad(4472).
4530 15	3 ⁻ ,4 ⁻				u	J ^π : L(p,p')=3 from 0 ⁺ .
4535 3	0 ⁺				u	J ^π : L(p,d)=0 from 7/2 ⁻ . XREF: Others: AC J ^π : L(p,t)=0 from 0 ⁺ .
4564.8 3	8 ⁽⁺⁾	>3.5 ps	DEF H J	0		XREF: Others: AD XREF: ad(4578).
4567	(⁻)		i			J ^π : spin=8 from py(θ) in (α,py); 1056.2γ to 6 ⁺ . XREF: Others: AA, AC, AD XREF: i(4570)ac(4571)ad(4578).
4580.69 7	3 ⁻	38 fs 16	ij LM	QR TU	Y	J ^π : L(d,t)=(2) from 7/2 ⁻ gives (1 ⁻ to 6 ⁻). XREF: Others: AA, AC, AD XREF: i(4570)Q(4596)U(4591)ac(4571)ad(4578).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{48}Ti Levels (continued)					
E(level) [†]	J ^π	T _{1/2} [@]	XREF		Comments
4589.3	0 ⁺		K m	r	J ^π : L(α,α')=L(p,t)=3 from 0 ⁺ . T _{1/2} : weighted average of 28 fs 14 from (α,pγ) and 62 fs 21 from (n,n'γ), both using DSAM. XREF: Others: AC , AD E(level): from (p,t). Other: 4590 15 from (t,p).
4719.137 22	4 ⁺	66 fs 18	IJ LM	TU	Y J ^π : L(p,t)=L(t,p)=0 from 0 ⁺ . XREF: Others: AA , AC , AD XREF: U(4726)AC(4725)ad(4729).
4757.73 10	(3 ⁻)		L		Z J ^π : L(p,t)=L(p,p')=4 from 0 ⁺ . T _{1/2} : from DSAM in (n,n'γ) (1993Ko57). Other: 66 fs 24 from DSAM in (α,pγ).
4783.27 12	(2 ⁺ ,3,4 ⁺)		i kLm	r	XREF: i(4791)k(4800)m(4789)r(4790). J ^π : 2486.4γ to 4 ⁺ , 3799.6γ to 2 ⁺ .
4792.31 5	(1 ⁻ ,2,3 ⁻)	28 fs 14	iJkLm	r	yz XREF: Others: AA , AC , AD XREF: i(4791)k(4800)m(4789)r(4790)ad(4806). J ^π : 1092.3γ to 1 ⁻ , 2371.2γ to 2 ⁺ , 1572.4γ from 3 ⁻ . Others: L(d,t)=L(p,d)=0 from 7/2 ⁻ , L(d,p)=1 from 5/2 ⁻ , L(t,p)=L(α,α')=2 from 0 ⁺ , and L(p,t)=3 from 0 ⁺ for a multiplet.
4794.11 13	(2 ⁺)		kLm	r u	y XREF: Others: AD XREF: k(4800)m(4789)r(4790)u(4802)ad(4806). J ^π : 4793.5γ to 0 ⁺ , 2498.4γ to 4 ⁺ ; L(t,p)=L(α,α')=2 from 0 ⁺ and L(d,p)=1 from 5/2 ⁻ for a multiplet.
4795.1 4	(3 ⁻ ,4)	70 fs 35	iJ m	u	z XREF: Others: AA , AC , AD XREF: i(4791)m(4789)u(4802)ad(4806). J ^π : 749γ to 5 ⁽⁻⁾ , 942γ to 3 ⁻ , 1571γ to 3 ⁺ . Others: L(d,t)=L(p,d)=0 from 7/2 ⁻ , L(d,p)=1 from 5/2 ⁻ , and L(p,t)=3 from 0 ⁺ for a multiplet.
4861.0 6	2 ⁺ ,3 ⁺ ,4 ⁺	21 fs 11	g IJ M		XREF: g(4900)M(4852). J ^π : L(d,p)=1 from 5/2 ⁻ ; 1622γ to 4 ⁺ .
4885.0 7	(2 ⁺ ,3 ⁺ ,4 ⁺)		g J		Z XREF: Others: AA , AD XREF: g(4900)Z(4890)AD(4879). J ^π : L(p,d)=(1+3) from 7/2 ⁻ ; 2464γ to 2 ⁺ , 1526γ to 3 ⁻ .
4910.57 5	(1 ⁺ ,2 ⁺)		J Lm	qr	U XREF: m(4914)q(4918)r(4910). J ^π : 4911.8γ to 0 ⁺ , 1686.6γ to 3 ⁺ . Other: 2 ⁺ from model-independent PWBA in (e,e') for a doublet at 4918, with B(E2)†=0.00138 21.
4916.3 5	5 ⁻	0.19 ps 11	iJ	r	Y XREF: Others: AA , AC , AD XREF: i(4927)r(4910)ad(4927). J ^π : L(α,α')=L(p,t)=5 from 0 ⁺ .
4924.92 14	(2,3,4) ⁺	21 fs 11	iJ Lm	qr	XREF: Others: AA , AD XREF: i(4927)m(4914)q(4918)r(4910)AA(4930)ad(4927). J ^π : L(p,d)=1+3 from 7/2 ⁻ ; 2629.1γ to 4 ⁺ , 851γ to 2 ⁺ . Other: see comment for 4911 level.
4939.93 15	(2,3,4) ⁺		iJ LM		T XREF: Others: AA , AD XREF: i(4927)T(?)ad(4927). J ^π : L(d,p)=1 from 5/2 ⁻ ; 3956.2γ to 2 ⁺ , 2644.5γ to 4 ⁺ .
4956.6 4	(4 ⁺ ,5,6 ⁻)	>1.0 ps	iJ		XREF: Others: AD J ^π : 1624γ to 6 ⁺ , 1173γ to J ^π =3 ⁻ ,4 ⁻ .
4966	2 ⁺		i		Y XREF: Others: AC , AD

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

⁴⁸ Ti Levels (continued)						
E(level) [†]	J ^π	T _{1/2} [@]	XREF			Comments
						XREF: ac(5000). J ^π : L(α,α')=2 from 0 ⁺ . XREF: Others: AC , AD XREF: Q(4997)ac(5000). J ^π : L(t,p)=0 from 0 ⁺ .
4970.7 7	0 ⁺		i JK	Q	U	XREF: Others: AA , AC , AD XREF: M(5000)U(5000)ac(5000)AD(5005). J ^π : L(d,t)=2 from 7/2 ⁻ ; 1484γ to 6 ⁺ , 1139γ to 3 ⁻ ; natural parity from presence in (α,α') spectra.
4992.0 5	5 ⁻		J M		U Y	XREF: Others: AD XREF: Others: AA , AC XREF: g(5200)m(5151)r(5150)T(?)AA(5150)ac(5160) J ^π : L(α,α')=4 from 0 ⁺ . XREF: Others: AA , AD XREF: aa(5158)ad(5169).
5063 12 5145.85 7	4 ⁺	50 fs 28	g IJ Lm	r T	Y	J ^π : spin=5 from pγ(θ) in (α,pγ); 751γ to 5 ⁽⁺⁾ can only be M1 from comparison with RUL. XREF: Others: AA , AC , AD XREF: g(5200)m(5151)r(5150)aa(5158)ac(5160)ad(51 69). J ^π : L(p,p')=4 from 0 ⁺ ; (2,3) from nuclear orientation and circular polarization in (n,γ) E=thermal is discrepant.
5155.7 7	5 ⁽⁺⁾	<7 fs	J			XREF: Others: AD XREF: ad(5169).
5158.0 3	4 ⁺	<25 fs	g J Lm	r U		XREF: Others: AD XREF: ad(5169).
5169.8 4	7 ⁺	28 fs 12	J			J ^π : spin=7 from pγ(θ) in (α,pγ); 1661γ M1+E2 to 6 ⁺ . XREF: Others: AA , AD XREF: AD(5184).
5170	(2,3,4,5) ⁺					J ^π : L(d,t)=3(+1) from 7/2 ⁻ . XREF: Others: AA , AD XREF: AA(5199)AD(5205).
5197.9 4	8 ⁺	76 fs 24	EF HIJ			J ^π : spin=8 from pγ(θ); 1689γ to 6 ⁺ can not be M2 from comparison to RUL. Other: L(d,t)=3(+1) from 7/2 ⁻ , giving J ^π =(2 to 5) ⁺ for a group at 5199, is inconsistent.
5241	1 ⁺			m Q		XREF: m(5255). J ^π : from model-independent analysis of measured σ(θ) in (e,e'). B(M1)↑=0.11 3 from (e,e'). XREF: Others: AD XREF: m(5255)ad(5266).
5251.8 6	(2 ⁺ ,3,4,5 ⁻)	49 fs +20–24	J m			J ^π : 1399γ to 3 ⁻ , 2957γ to 4 ⁺ . XREF: Others: AD XREF: ad(5266).
5273.0 5	(1 ⁻ ,2)		J		U	J ^π : 962γ to 1 ⁺ , 1571γ to 1 ⁻ , 1915γ to 3 ⁻ . XREF: m(5303).
5300.9 6	(4 ⁺ ,5,6)	<35 fs	J m			J ^π : 1792γ to 6 ⁺ ; 896γ to 5 ⁽⁺⁾ can not be E2 or M2. XREF: Others: AA , AD XREF: m(5303)ad(5317).
5312.8 4	(5 ⁻)	69 fs 28	IJ m			spin=5,6,7 from pγ(θ) in (α,pγ); 1266γ M1,E2 to 5 ⁽⁻⁾ ; 2185γ from (4 ⁺). XREF: Others: AD
5313.3 6	2 ⁺		J m	Q T	Y	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF	Comments
				XREF: m(5303)T(?)ad(5317). J ^π : from model-independent analysis of measured $\sigma(\theta)$ in (e,e'). B(E2)↑=0.00164 28 (1990Gu09) from (e,e').
5340 3 5356.23 13	1 ⁽⁻⁾ ₂ [‡] (2 ⁺ ,3,4 ⁺)		J L P U r	XREF: U(5329). XREF: Others: AD XREF: r(5360)AD(5371). J ^π : 4372.6γ to 2 ⁺ , 3062γ to 4 ⁺ .
5383.8 7	(3) ⁻		I J r Y	XREF: Others: AA, AD XREF: I(5378)r(5360)ad(5395). J ^π : L(α,α')=(3) from 0 ⁺ , L(d,t)=2 from 7/2 ⁻ .
5391 9	4 ⁺		M U	XREF: Others: AD XREF: M(5382)U(5400)ad(5395). J ^π : L(p,p')=4 from 0 ⁺ , L(d,p)=1+3 from 5/2 ⁻ .
5461	2 ⁺ ,3 ⁺ ,4 ⁺ ,5 ⁺			XREF: Others: AA, AC XREF: ac(5510). J ^π : L(d,p)=1+3 from 5/2 ⁻ .
5490.95 21	2 ⁺		i J K L m	XREF: Others: AC XREF: i(5497)K(5499)m(5493)ac(5510). J ^π : L(t,p)=2 from 0 ⁺ .
5500.8 4	4 ⁺	26 fs 12	i J m	XREF: Others: AC, AD XREF: i(5497)m(5493)ac(5510)ad(5509). J ^π : 2168γ to 6 ⁺ and 1226γ to 2 ⁺ can not be M2 from comparison to RUL.
5521.7 6	3 ⁻		i J m Y	XREF: Others: AA, AC, AD XREF: i(5521)m(5520)ac(5510)ad(5509). J ^π : L(α,α')=3 from 0 ⁺ .
5526 3	1 ₂ [‡]		i m P	XREF: Others: AC, AD XREF: i(5521)m(5520)ac(5510)AD(5530).
5545.9 7	(4 ⁺ to 8 ⁺)		i J m	XREF: Others: AC, AD XREF: i(5547)m(5546)ac(5510)ad(5555). J ^π : 2213γ to 6 ⁺ .
5545.9 5	3 ⁻		i J m R U	XREF: Others: AA, AC, AD XREF: i(5547)m(5546)R(5540)U(5537)ac(5510)ad(5555).
5562	(3) ⁻		Q U	J ^π : L(p,p')=L(π ⁺ ,π ⁺)=3 from 0 ⁺ . XREF: Others: AD XREF: U(5578)ad(5555). J ^π : from $\sigma(\theta)$ and analyzing powers in (p,p') and also from model-independent analysis of measured $\sigma(\theta)$ in (e,e').
5567.9 6	2 ⁺		J Q	XREF: Others: AD XREF: ad(5555). J ^π : from model-dependent PWBA in (e,e'). B(E2)↑=0.00093 20 (1990Gu09) from (e,e').
5615.8 5	(3) ⁻		J	XREF: Others: AA J ^π : L(d,t)=0 from 7/2 ⁻ ; 4632γ to 2 ⁺ .
5619.65 10	2 ⁺		i J L M Q R U Y	XREF: Q(5633)U(5633)Y(5614). J ^π : L(α,α')=2 from 0 ⁺ . B(E2)↑=0.0019 5 (1990Gu09) from (e,e').
5630.9 4	7	24 fs 14	i J	XREF: Others: AD J ^π : from $\rho\gamma(\theta)$ in (α,py).
5640.03 5	1 ⁺ ₂ [‡]	<0.96 fs	i J L M P Q	XREF: Others: AD T _{1/2} : from $\Gamma_{\gamma_0}^2/\Gamma$ in (γ,γ') and adopted branching ratio of 5640γ. B(M1)↑=0.47 8 (1990Gu09) from (e,e').

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF				Comments
5641.5 4	3 ⁻	24 fs 11	J				XREF: Others: AA, AD J ^π : L(d,t)=0+2 from 7/2 ⁻ gives 3 ⁻ ,4 ⁻ ; 4 ⁻ ruled out by 1939γ to 1 ⁻ .
5657	1 ⁺		m	Q			XREF: Others: AD XREF: m(5763). J ^π : from model-independent analysis of measured σ(θ) in (e,e').
5760	(3 ⁻)		i	m		Y	B(M1)↑=0.25 4 (1990Gu09) from (e,e'). XREF: i(5770)m(5763).
5762.8 5	(4 ⁺ ,5,6 ⁺)		iJ	m		u	J ^π : L(α,α')=(3) from 0 ⁺ . XREF: Others: AD XREF: i(5770)m(5763)u(5777)ad(5775).
5764	2 ⁺		i	m	Q	u	J ^π : 2254γ to 6 ⁺ , 2523γ to 4 ⁺ . XREF: Others: AD XREF: i(5770)m(5763)u(5777)ad(5775). J ^π : from model-independent analysis of measured σ(θ) in (e,e').
5805.2 7	3 ⁻ ,4 ⁻	21 fs 12	J				B(E2)↑=0.00031 10 (1990Gu09) from (e,e'). XREF: Others: AA J ^π : L(d,t)=0+2 from 7/2 ⁻ .
5827.1 5	3 ⁻		iJ		Q	Y	XREF: Others: AA XREF: i(5840)Q(5835).
5846.5 6	3 ⁻	<21 fs	iJ		r	U	J ^π : L(α,α')=3 from 0 ⁺ . XREF: i(5840)r(5870).
5884?	(3 ⁻)		i		Qr		J ^π : L(α,α')=L(p,p')=3 from 0 ⁺ . XREF: Others: AA XREF: i(5886)r(5870).
5885?	2 ⁺		i	m	r	Y	E(level): see comment for 5888.5 level. J ^π : from model-independent analysis of measured σ(θ) in (e,e'); L(d,t)=2 from 7/2 ⁻ for a group at 5886. XREF: i(5886)m(5888)r(5870).
5886.7 7	(4 ⁺ to 8 ⁺)		iJ	m			E(level): see comment for 5888.5 level. J ^π : L(α,α')=2 from 0 ⁺ . XREF: i(5886)m(5888).
5888.41 10	(1,2,3)		i	Lm	r		J ^π : 2378γ to 6 ⁺ . Other: L(d,p)=1 from 5/2 ⁻ for a group at 5888 12 gives 1 ⁺ ,2 ⁺ ,3 ⁺ ,4 ⁺ . XREF: i(5886)m(5888)r(5870).
5892.1 5	(1 ⁻ ,2 ⁺)		J	m			One of the 5884, (3 ⁻) and 5885, 2 ⁺ levels could correspond to this level, and the other one is a separate level. J ^π : 2085.7γ to 2 ⁻ , 2517.6γ to 2 ⁺ . XREF: m(5888).
5917.8 10	2 ⁺		J		Q	U	J ^π : 5892γ to 0 ⁺ , 2533γ to 3 ⁻ . XREF: Q(5940)U(5928).
5974.8 5	(4 ⁺ ,5,6)		iJ				J ^π : L(α,α')=L(p,p')=2 from 0 ⁺ . XREF: i(5990).
5988	1 ⁺ ,3 ⁺		i	m	Q	y	J ^π : 2466γ to 6 ⁺ , 1570γ to 5 ⁽⁺⁾ , 662γ to (5 ⁻). XREF: Others: AA XREF: i(5990)m(5990).
5990.8 6	(4 ⁺ ,5,6 ⁺)		iJ	m			J ^π : from model-dependent PWBA in (e,e'). B(M1)↑=0.08 3, B(M3)↑=0.236 59 from (e,e') (1990Gu09).
5993.6 6	(2 ⁺)		iJ	m	Q	Y	XREF: Others: AA XREF: i(5990)m(5990).
							J ^π : 2751γ to 4 ⁺ , 1592γ to 6 ⁺ . XREF: Others: AA

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF			Comments
6022 10	(3 ⁻)		K	Q	U	XREF: i(5990)m(5990)Q(6011). J ^π : L(α,α')=(2) from 0 ⁺ . Other: 2 ⁺ ,3 ⁺ from model-dependent PWBA for a group at 6011 in (e,e'). B(E2)=0.00051 12 (1990Gu09) from (e,e'). E(level): weighted average of 6014 15 from (t,p) and 6025 10 from (p,p'). Other: 6029 from (e,e'). J ^π : from model-independent analysis of measured σ(θ) in (e,e');
6034.9 6	9 ⁺ ,7 ⁺ #	<21 fs	F	iJ		XREF: i(6050). J ^π : spin from py(θ) in (α,py); M1+E2 γ to 8 ⁺ .
6036.8 10	4 ⁺		iJ	m	Y	XREF: Others: AA, AC XREF: i(6050)m(6043)ac(6050). J ^π : L(α,α')=4 from 0 ⁺ . XREF: i(6050). J ^π : from py(θ) in (α,py). XREF: Others: AA XREF: i(6050)m(6043). J ^π : 6040γ to 0 ⁺ . XREF: Others: AA XREF: i(6050)m(6043). J ^π : from nuclear orientation and circular polarization in (n,γ) E=thermal.
6039.7 5	6	25 fs 17	iJ			XREF: Others: AC XREF: i(6050)m(6043)q(6061)ac(6050). J ^π : see comment for 6055 level. XREF: Others: AC XREF: i(6050)q(6061)ac(6050). J ^π : 3633.4γ to 2 ⁺ . Other: 1 ⁺ ,3 ⁺ from model-dependent PWBA in (e,e') for a doublet, with B(M1)↑=0.10 3 and B(M3)↑=0.15 4 (1990Gu09).
6040.4 10	(1,2)		iJ	m		XREF: Others: AA XREF: i(6050)m(6043). J ^π : 6040γ to 0 ⁺ . XREF: Others: AA XREF: i(6050)m(6043). J ^π : from nuclear orientation and circular polarization in (n,γ) E=thermal.
6042.40 11	(2,3)		iJ	Lm		XREF: Others: AC XREF: i(6050)m(6043)q(6061)ac(6050). J ^π : see comment for 6055 level. XREF: Others: AC XREF: i(6050)q(6061)ac(6050). J ^π : 3633.4γ to 2 ⁺ . Other: 1 ⁺ ,3 ⁺ from model-dependent PWBA in (e,e') for a doublet, with B(M1)↑=0.10 3 and B(M3)↑=0.15 4 (1990Gu09).
6050.5 10			iJ	m	q	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6054.47 22	(0 ⁺ to 4 ⁺)		iJ	L	q	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6065	3 ⁻				Qr U Y	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6084.3 6	(4 ⁺ ,5,6 ⁻)		J			XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6086 4	1 [‡]				P	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6103.2 7	10 ⁽⁺⁾ ,8 [#]	>1.4 ps	EF HIJ			XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6115	2 ⁺			m	Y	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6119.6 5	(4 ⁺ ,5)		J	m		XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6122	0 ⁺			m	Q	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6126 3	1 [‡]		J	m	P	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6138 4	1 ⁽⁺⁾ ‡			m	P U	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6147.8 11	(4 ⁺ to 8 ⁺)		J	m		XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6153.8 6	(4 ⁺ to 7 ⁻)		J			XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6168?	3 ⁻ ,4 ⁻					XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6172.9 6	8 ⁺ ,6 ⁺	35 fs 28	J			XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .
6176.4 7	(2 ⁺ ,3,4,5 ⁻)		J		T y	XREF: Others: AA XREF: Q(6077)r(6090)U(6083). J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6050). J ^π : 2576γ to 6 ⁺ , 2301γ to 3 ⁻ ,4 ⁻ .

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	XREF			Comments
					J ^π : 2817γ to 3 ⁻ , 3881γ to 4 ⁺ . Other: L(α,α')=2 from 0 ⁺ for a group at 6178.
6183.8 7	(2 ⁺ to 6 ⁺)	J	u	y	XREF: u(6200)y(6178).
6203	2 ⁻		Q		J ^π : 2944γ to 4 ⁺ . Other: L(α,α')=2 from 0 ⁺ for a group at 6178.
6223.8 10	(0 ⁺ to 4 ⁺)	J	u		J ^π : from model-independent analysis of measured σ(θ) in (e,e'). XREF: Others: AC XREF: u(6200)ac(6230).
6233.6 6	3 ⁻	J		Y	J ^π : 5240γ to 2 ⁺ . XREF: Others: AC XREF: ac(6230).
6236 3	2 ⁺ [‡]		P		J ^π : L(α,α')=3 from 0 ⁺ . XREF: Others: AC XREF: ac(6230).
6241.0 4	(4 ⁺ ,5 ⁻)	L			XREF: Others: AA XREF: aa(6248).
6243.8 7	(0 ⁺ to 3 ⁺)	J			J ^π : 2907.7γ to 6 ⁺ ; primary 5387.3γ from 2 ⁻ ,3 ⁻ . XREF: Others: AA XREF: aa(6248).
6253.7 6	3 ⁻	J	Q	u	J ^π : 2505γ to 1 ⁺ , 2873γ to 2 ⁺ . Other: L(d,t)=3(+1) from 7/2 ⁻ for a group at 6248. XREF: Q(6248)u(6258).
6267.8 10	(3 ⁻)	J	Q	u	J ^π : from model-dependent PWBA in (e,e'); also L(p,p')=3 from 0 ⁺ for a group at 6258 10. B(E3)↑=0.0035 4 from (e,e'). XREF: u(6258).
6313.7 3	(4 ⁺ ,5 ⁻)	Lm			J ^π : from model-independent PWBA in (e,e').
6315.4 5	(2 ⁺ ,3,4 ⁺)	J m			J ^π : 2980.4γ to 6 ⁺ ; primary 5312.6γ from 2 ⁻ ,3 ⁻ .
6322.0 7	(2,3,4)	J m	u		J ^π : 2698γ to 2 ⁺ , 4021γ to 4 ⁺ . XREF: Others: AA XREF: aa(6327).
6331.1 10	(1 ⁺ to 5 ⁺)	J	u		J ^π : 2963γ to 3 ⁻ , 3098γ to 3 ⁺ . XREF: Others: AA XREF: aa(6327).
6336.5 10	3 ⁻	J	u	Y	J ^π : 3107γ to 3 ⁺ . XREF: Others: AA XREF: Y(6342)aa(6327).
6363.8 7	(3,4) ⁺	J M			J ^π : L(p,p')=3 from 0 ⁺ .
6365.16 9	3 ⁻	L	R	U	J ^π : 1959γ to 5 ⁽⁺⁾ , 3124γ to 4 ⁺ ; L(d,p)=1 from 5/2 ⁻ . XREF: R(6360).
6394.8 6	(6 ⁺ ,7 ⁻)	IJ			J ^π : L(p,p')=L(π ⁺ ,π ⁺)=3 from 0 ⁺ .
6400.9 6	(4 ⁺ to 8 ⁺)	J			J ^π : 1197γ to 8 ⁺ , 1082γ to (5 ⁻). J ^π : 2002γ to 6 ⁺ .
6406.0 3	(1 ⁻ to 5 ⁻)	L			XREF: Others: AA XREF: aa(6407).
6414.8 10	(2 ⁺ to 6 ⁺)	J	q		J ^π : 2553.7γ to 3 ⁻ . Other: L(d,t)=0 from 7/2 ⁻ gives 3 ⁻ ,4 ⁻ for a group at 6407. XREF: Others: AA XREF: q(6424)aa(6407).
6434.6 10	(3 ⁻ to 7 ⁻)	J	q		J ^π : 4119γ to 4 ⁺ . Other: L(d,t)=0 from 7/2 ⁻ gives 3 ⁻ ,4 ⁻ for a group at 6407; 3 ⁻ from model-dependent PWBA in (e,e') for a group at 6424, with B(E3)↑=0.0056 29. XREF: q(6424).
6451.1 6	(2 ⁺ ,3,4)	J	r		J ^π : 2388γ to 5 ⁽⁻⁾ . Others: see comment for 6414 level. XREF: r(6500).
6461.3 10	(4 ⁺ to 8 ⁺)	J			J ^π : 2598γ to 3 ⁻ , 3227γ to 3 ⁺ , 3212γ to 4 ⁺ . J ^π : 3128γ to 6 ⁺ .

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF				Comments
6475.3 10	3 ⁻		J	r	U	Y	XREF: r(6500)U(6484)Y(6462). J ^π : L(α,α')=L(p,p')=3 from 0 ⁺ .
6490.36 15	(2 ⁺ ,3)		i	Lm	r		J ^π : 2687.5γ to 2 ⁻ , 5506.4γ to 2 ⁺ , 3252.4γ to 4 ⁺ .
6491.6 7	(0 ⁺ to 4 ⁺)		iJ	m	r	u	XREF: u(6503). J ^π : 4070γ to 2 ⁺ .
6493.5 6	(4 ⁺ ,5,6,7 ⁻)		iJ	m		u	XREF: u(6503). J ^π : 2985γ to 6 ⁺ , 1577γ to 5 ⁻ .
6507.8 5	(6 ⁺ ,7 ⁻)		J				J ^π : 1943γ to 8 ⁺ , 2461γ to 5 ⁽⁻⁾ .
6518.5 7	4 ⁺		J		u	Y	XREF: u(6503)Y(6509). J ^π : L(α,α')=4 from 0 ⁺ .
6524.6 10	(4 ⁺ to 8 ⁺)		J				J ^π : 3016γ to 6 ⁺ .
6529.5 10	(1 ⁻ to 6 ⁻)		J				J ^π : 2747γ to 3 ⁻ ,4 ⁻ .
6537.0 7	(4 ⁺ to 7 ⁻)		J		u		XREF: u(6542). J ^π : 2490γ to 5 ⁽⁻⁾ , 3204γ to 6 ⁺ .
6538.9 10			J		u		XREF: u(6542).
6542.0 3	(0 ⁺ to 4 ⁺)		L		u		XREF: u(6542). J ^π : 5558.1γ to 2 ⁺ .
6544.8 10	(2 ⁺ to 6 ⁺)		J		u		XREF: u(6542). J ^π : 4249γ to 4 ⁺ .
6573.9 5	(5,6,7 ⁺)		J				J ^π : 943γ to J=7, 2169γ to 5 ⁽⁺⁾ .
6584.4 7	(3 ⁻)		J			Y	J ^π : L(α,α')=(3) from 0 ⁺ .
6604.3 24	1 ⁻	0.86 eV 20	J	P	U		T _{1/2} : from resonance σ versus temperature in (γ,γ') (1983Mo06).
6617.7 10	(4 ⁺ to 8 ⁺)		J				XREF: Others: AA, AC XREF: aa(6623)ac(6650). J ^π : 3109γ to 6 ⁺ .
6627.6 4	(0 ⁻ ,1,2,3)		Lm				XREF: Others: AA XREF: aa(6623). J ^π : 2888.9γ to 1 ⁺ , primary 4999.97γ from 2 ⁻ ,3 ⁻ . Other: L(d,t)=(0+2) from 7/2 ⁻ gives 3 ⁻ ,4 ⁻ for a group at 6623.
6634.3 6	(3 ⁻ ,4,5 ⁻)		J	m		u	XREF: Others: AA, AC XREF: u(6641)aa(6623)ac(6650). J ^π : 2781γ to 3 ⁻ , 2588γ to 5 ⁽⁻⁾ .
6652.6 10	(1 ⁻ to 6 ⁻)		J		q	u	XREF: Others: AC XREF: q(6648)u(6641)ac(6650). J ^π : 2870γ to 3 ⁻ ,4 ⁻ . Other: 3 ⁺ from model-dependent PWBA in (e,e') with B(M3)↑=0.157 4I.
6661.6 10	(3 ⁻ to 7 ⁻)		IJ		q		XREF: Others: AC XREF: q(6648)ac(6650). J ^π : 2615γ to 5 ⁽⁻⁾ . Other: see comment for 6653 level.
6672.6 10	(2,3,4) ⁺		J	M		U	XREF: M(6681)U(6687). J ^π : L(d,p)=1+3 from 5/2 ⁻ ; 2890γ to 3 ⁻ ,4 ⁻ .
6707.29 21	(2 ⁺ ,3,4)		i	L	qr	y	XREF: Others: AA XREF: r(6700)y(6701)aa(6713). J ^π : 3483.5γ to 3 ⁺ , 4411.1γ to 4 ⁺ ; primary 4917.6γ from 2 ⁻ ,3 ⁻ . Other: see comment for 6707 level.
6707.4 6	(2 ⁺ ,3,4 ⁺)		iJ		qr	Y	XREF: Others: AA XREF: r(6700)Y(6701)aa(6713). J ^π : 5724γ to 2 ⁺ , 4412γ to 4 ⁺ . Other: L(α,α')=4 from 0 ⁺ for a group at 6701 and L(π ⁺ ,π ⁺ ') from 0 ⁺ for a group at 6700 gives 4 ⁺ , L(d,t)=(3) from

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

⁴⁸ Ti Levels (continued)						
E(level) [†]	J ^π	T _{1/2} [@]	XREF			Comments
						7/2 ⁻ for a group at 6713; 1 ⁺ ,3 ⁺ from model-dependent PWBA in (e,e') for a doublet, with B(M1)↑=0.21 7, B(M3)↑=0.206 41.
6711.6 6	(4 ⁺ ,5,6,7 ⁻)		iJ	qr	y	XREF: r(6700)y(6701). J ^π : 3203γ to 6 ⁺ , 1795γ to 5 ⁻ . Other: see comment for 6707 level.
6722	3 ⁻				U	J ^π : L(p,p')=3 from 0 ⁺ .
6740 5	(2 ⁺ ,3 ⁻)		m		Y	XREF: m(6747). J ^π : L(α,α')=(2,3) from 0 ⁺ .
6744.9 5	(4 ⁺ ,5,6 ⁺)		J m			XREF: m(6747). J ^π : 3236γ to 6 ⁺ , 4449γ to 4 ⁺ . Other: L(d,p)=1+3 from 5/2 ⁻ for a group at 6747 12.
6755	3 ⁺		m	Q		XREF: m(6747). J ^π : from model-dependent PWBA in (e,e'). B(M3)↑=0.327 69 from in (e,e').
6757.9 6	(6 ⁺ ,7,8,9)		IJ		U	J ^π : 1560γ to 8 ⁺ , 1127γ to J=7.
6771.3 10	(4 ⁺ to 8 ⁺)		J			J ^π : 3438γ to 6 ⁺ .
6798.0 6	(1 ⁺ ,2,3,4)		L		y	XREF: Others: AA J ^π : 3573.9γ to 3 ⁺ ; primary 4829.7γ from 2 ⁻ ,3 ⁻ . Others: L(α,α')=(5,4) from 0 ⁺ for a group at 6797 is inconsistent with L(d,t)=(0+2) from 7/2 ⁻ for a group at 6797.
6808.5 11			J	r u	y	XREF: Others: AA XREF: u(6816)y(6797)aa(6797).
6814.9 10	(3 ⁻)		J		u	XREF: u(6816). J ^π : from DWBA analysis and analyzing power in (p,p') for a group at 6816 10.
6825.7 7	(4 ⁺ to 8 ⁺)		J	r		XREF: r(6830). J ^π : 2427γ to 6 ⁺ .
6827.8 3	(2 ⁺ ,3,4 ⁺)		L	r		XREF: r(6830). J ^π : 5843.7γ to 2 ⁺ , 2108.7γ to 4 ⁺ ; primary 4799.8γ from 2 ⁻ ,3 ⁻ .
6831.6 7	(0 ⁺ to 4 ⁺)		J	r		XREF: r(6830). J ^π : 4410γ to 2 ⁺ .
6841.9 7	3 ⁻		J	r U	Y	XREF: r(6830)U(6839)Y(6831). J ^π : L(p,p')=L(α,α')=3 from 0 ⁺ .
6869.0 10	(1 ⁻ to 5 ⁻)		iJ			J ^π : 3510γ to 3 ⁻ .
6878.3 10	(0 ⁺ to 4 ⁺)		iJ			J ^π : 4457γ to 2 ⁺ .
6880.9 8	(6 ⁺ ,7 ⁻)	125 fs +69–56	iJ			J ^π : 2316γ to 8 ⁺ , 1568γ to J ^π =(5 ⁻).
6886.0 7	(4 ⁺ to 8 ⁺)		iJ			J ^π : 3377γ to 6 ⁺ .
6898.0 6	(1,2 ⁺)		L			J ^π : 3901γ to 0 ⁺ .
6907.0 8	10,8,6 [#]	97 fs +76–63	F J			J ^π : from γ(θ) in (α,py).
6916.7 10	(3 ⁻ to 7 ⁻)		J			XREF: Others: AC XREF: ac(6950). J ^π : 2870γ to 5 ⁽⁻⁾ .
6944.7 7	(4 ⁺ ,5,6,7 ⁻)		J			XREF: Others: AC XREF: ac(6950). J ^π : 2898γ to 5 ⁽⁻⁾ , 3436γ to 6 ⁺ .
6955.8 7	(5 ⁺ to 8 ⁺)		J			XREF: Others: AC XREF: ac(6950). J ^π : 1786γ to 7 ⁺ , 3447γ to 6 ⁺ .
6957.0 3	(1 ⁻ ,2,3,4 ⁺)		L	r u	y	XREF: Others: AC XREF: r(6960)u(6963)y(6957)ac(6950). J ^π : 3104.4γ to 3 ⁻ , 4536.0γ to 2 ⁺ . Others: L(α,α')=3, L(p,p')=3, and L(π ⁺ ,π ⁺)=3 from 0 ⁺ for a group at 6957, 6963 10 and 6960, respectively.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	XREF				Comments
6966.9 10	(2 ⁺ to 6 ⁺)	J	r	u	y	XREF: Others: AC XREF: r(6960)u(6963)y(6957)ac(6950). J ^π : 4671γ to 4 ⁺ . Others: see comment for 6957 level.
6971.9 10	(0 ⁺ to 4 ⁺)	J				XREF: Others: AC XREF: ac(6950). J ^π : 5988γ to 2 ⁺ .
6975.4 8	(3 ⁻ to 7 ⁻)	J				XREF: Others: AC XREF: ac(6950). J ^π : 1983γ to 5 ⁻ .
6976.30 20	(1,2,3,4 ⁺)	L				XREF: Others: AC XREF: ac(6950). J ^π : 2941.0γ to 2 ⁺ ; primary 4649.9γ from 2 ⁻ , 3 ⁻ .
6979 3	1- $\frac{3}{2}$		P			XREF: Others: AC XREF: ac(6950).
6983.4 10	(1 ⁻ to 5 ⁻)	J				XREF: Others: AC XREF: ac(6950).
6985.8 5	(6 ⁺ , 7)	J				J ^π : 3131γ to 3 ⁻ . XREF: Others: AC XREF: ac(6950).
7033.5 11	(4 ⁺)	J		U		J ^π : 2421γ to 8 ⁺ , 3477γ to 6 ⁺ , 2029γ to (4 ⁺ , 5, 6 ⁻). XREF: U(7036). J ^π : from DWBA analysis and analyzing power in (p,p') for a group at 7036 10.
7040.9 8	(6 ⁺ , 7, 8, 9 ⁺)	iJ				J ^π : 2476γ to 8 ⁺ , 467γ to (5, 6, 7 ⁺).
7041 4	1,2 $\frac{3}{2}$	i	P			
7054.0 10	(3 ⁻)	J			y	XREF: Others: AA XREF: y(7058)AA(7042). J ^π : L(α,α')=(3) for a group at 7058 and L(d,t)=(0+2) from 9/2 ⁻ for a group at 7042.
7060.80 22	(0 ⁻ , 1, 2, 3 ⁻)	L				J ^π : 3361.2γ to 1 ⁻ ; primary 4566.3γ from 2 ⁻ , 3 ⁻ .
7067.0 10	(3 ⁻ , 4 ⁺)	J		U		XREF: U(7082). J ^π : from DWBA analysis and analyzing power in (p,p') for a group at 7082 10.
7071? 4	1+ $\frac{3}{2}$		PQ			J ^π : also 1 ⁺ , 3 ⁺ from model-dependent PWBA analysis in (e,e'). B(M1)↑=0.18 7, B(M3)↑=0.186 99 from (e,e') (1990Gu09).
7076.0 6	(6 ⁺ to 10 ⁺)	J				J ^π : 1878γ to 8 ⁺ .
7094.1 7	(5 ⁺ to 8 ⁺)	J				J ^π : 1924γ to 7 ⁺ , 3761γ to 6 ⁺ .
7100.9 10	(2 ⁺ to 6 ⁺)	J				J ^π : 4805γ to 4 ⁺ .
7110 5	1 $\frac{3}{2}$		P	u		
7111.9 11	(5 to 9)	J		u		J ^π : 1481γ to 7.
7118.9 4	(6 ⁺ , 7 ⁻)	J		u		J ^π : 1921γ to 8 ⁺ , 1806γ to (5 ⁻).
7124 3	1- $\frac{3}{2}$		P	u		
7129? 10	(2 ⁺)			U		J ^π : L(p,p')=(2) from 0 ⁺ .
7149.8 11	(4 ⁺ to 8 ⁺)	J		u		J ^π : 2751γ to 6 ⁺ .
7162.7 10	(4 ⁺ to 8 ⁺)	J		u		J ^π : 3654γ to 6 ⁺ .
7183.6 7	(0 ⁺ to 4 ⁺)	J				J ^π : 4762γ to 2 ⁺ .
7199.3 10	(0 ⁺ to 4 ⁺)	J		u		J ^π : 4778γ to 2 ⁺ . Other: L(p,p')=(3) from 0 ⁺ gives (3 ⁻) for a group at 7221 10.
7221.6 7	(1,2,3,4 ⁺)	J		u		J ^π : 3147γ to 2 ⁺ , 2840γ to (3,4,5 ⁻). Other: L(p,p')=(3) from 0 ⁺ gives (3 ⁻) for a group at 7221 10.
7221.6 20	1 ⁺		M	PQ		XREF: M(7228). J ^π : also from model-dependent PWBA analysis in (e,e'). B(M1)↑=1.01 6 from (e,e') (1990Gu09).
7256.8 7	(4 ⁺)	J	M		U	J ^π : 3210γ to 5 ⁽⁻⁾ , 4017γ to 4 ⁺ ; L(d,p)=1+3 from 5/2 ⁻ .
7275.1 6	(4 ⁺)	J				J ^π : 1962γ to 2 ⁺ , 3766γ to 6 ⁺ .

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{48}Ti Levels (continued)					
E(level) [†]	J ^π	T _{1/2} [@]	XREF		Comments
7290.0 10	3 ⁺		J	Q	XREF: Q(7296). J ^π : from model-dependent PWBA in (e,e'). B(M3)↑=0.41 16 from (e,e') (1990Gu09).
7323.0 10	3 ⁻		J	U	J ^π : L(p,p')=3 from 0 ⁺ .
7326.9 8	(6 ⁺ to 10 ⁺)		J		J ^π : 2129γ to 8 ⁺ .
7344.8 11	(4 ⁺ to 8 ⁺)		J	m	XREF: m(7355). J ^π : 2946γ to 6 ⁺ .
7353.9 11	(5 to 9)		iJ	u	J ^π : 1723γ to 7.
7358.98 16	2 ⁺		i Lm Q	u	XREF: m(7355)Q(7346). J ^π : from model-dependent PWBA in (e,e'); L(d,p)=1 from 5/2 ⁻ .
7375.1 10	11,9,7 [#]	28 fs +42-28	F J		B(E2)↑=0.00085 19 from (e,e') (1990Gu09). J ^π : from pγ(θ) in (α,pγ). T _{1/2} : from DSAM in (¹⁴ C,2nγ) (1986Wa19).
7387.9 11			J	U	XREF: U(7400).
7427.9 7	9,7 [#]	>0.7 ps	iJ		J ^π : from pγ(θ) in (α,pγ).
7431.9 10	(2,3,4) ⁺		iJ M		XREF: M(7428). J ^π : 5136γ to 4 ⁺ ; L(d,p)=1 from 5/2 ⁻ .
7442.9 7	(4 ⁺ ,5,6 ⁺)		J		J ^π : 3044γ to 6 ⁺ , 5147γ to 4 ⁺ .
7450 3	1 ⁻ ‡			P	
7476.8 8	(3 ⁺ to 7 ⁺)		J m		J ^π : 3072γ to 5 ⁽⁺⁾ .
7484.0 10	(0 ⁺ to 4 ⁺)		J m		J ^π : 6500γ to 2 ⁺ .
7484 4	1 [‡]			m P	
7497.9 11	(4 ⁺)		J	U	J ^π : L(p,p')=(4) from 0 ⁺ .
7531.9 6	(6 ⁺ ,7,8 ⁺)		iJ		XREF: Others: AC XREF: ac(7550). J ^π : 2334γ to 8 ⁺ , 3133γ to 6 ⁺ .
7536.0 7			iJ		XREF: Others: AC XREF: ac(7550).
7541.71 9	(2 ⁺ ,3,4 ⁺)		L	u	XREF: Others: AC XREF: u(7551)ac(7550). J ^π : 4302.6γ to 4 ⁺ , 3344.7γ to (2 ⁺). Other: L(p,p')=3 from 0 ⁺ gives 3 ⁻ for a group at 7551.
7557.0 10	(2 ⁺ to 6 ⁺)		J M	u	XREF: Others: AC XREF: u(7551)ac(7550). J ^π : 5261γ to 4 ⁺ . Other: see comment for 7542 level.
7572.4 10	(4 ⁺ to 8 ⁺)		J		XREF: Others: AC XREF: ac(7550). J ^π : 4239γ to 6 ⁺ .
7574.15 22	(2 ⁺ ,3,4,5 ⁻)		L		XREF: Others: AC XREF: ac(7550). J ^π : 3186.4γ to 4 ⁺ ; primary 4052.5γ from 2 ⁻ ,3 ⁻ .
7586 4	1 ⁽⁻⁾ ‡			P	XREF: Others: AC XREF: ac(7550).
7588.1 6	(5,6,7,8 ⁺)		J		XREF: Others: AC XREF: ac(7550).
7616.13 17	(1 ⁻ ,2)		i L	U	J ^π : 4255γ to 6 ⁺ , 1957γ to 7. XREF: U(?). J ^π : 3852.3γ to 3 ⁻ , 3876.8γ to 1 ⁺ , 3916.8γ to 1 ⁻ . Other: (4 ⁺) from DWBA analysis and analyzing power in (p,p') for a group at 7618 10 is inconsistent, which could indicate a different level.
7623.9 8	(6 ⁺ ,7 ⁻)		iJ		J ^π : 2311γ to (5 ⁻), 3059γ to 8 ⁺ .

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{48}Ti Levels (continued)

E(level) [†]	J ^π	T _{1/2} [@]	XREF				Comments
7656.9 11	(6 ⁺ to 10 ⁺)		J				J ^π : 3092γ to 8 ⁺ .
7669.2 12	10,8 [#]		J				J ^π : from pγ(θ) in (α,pγ).
7683 10	(2 ⁺ ,3 ⁻)			U			J ^π : from DWBA analysis and analyzing power in (p,p').
7692 10			m	U			XREF: m(7707).
7709.7 10	(3 ⁻ to 7 ⁻)		J m				XREF: Others: AC
							XREF: m(7707)ac(7750).
							J ^π : 3663γ to 5 ⁽⁻⁾ .
7728 10	(3 ⁻)			U			J ^π : L(p,p')=(3) from 0 ⁺ .
7765 10	1 ⁺ ,2 ⁺ ,3 ⁺ ,4 ⁺		M	U			XREF: Others: AC
							XREF: ac(7750).
							E(level): weighted average of 7757 12 from (d,p) and 7771 10 from (p,p').
							J ^π : L(d,p)=1+3 from 5/2 ⁻ .
7845 10	1 ⁺ ,3 ⁺		M Q U				XREF: Others: AC
							XREF: Q(7826)ac(7880).
							E(level): weighted average of 7836 12 from (d,p) and 7853 10 from (p,p').
							J ^π : 1 ⁺ ,2 ⁺ ,3 ⁺ ,4 ⁺ from L(d,p)=1+3; 1 ⁺ ,3 ⁺ from model-dependent PWBA in (e,e'). Other: (4 ⁺) from σ(θ) and analyzing powers in (p,p') is discrepant.
7876 10	3 ⁺			Q U			B(M3)↑=0.038 11 from (e,e') (1990Gu09).
							XREF: Others: AC
							XREF: Q(7872)ac(7880).
							E(level): from (p,p').
							J ^π : from model-dependent PWBA in (e,e').
7905 10	1 ⁺			Q U			B(M3)↑=0.30 9 from (e,e') (1990Gu09).
							XREF: Others: AC
							XREF: Q(7911)ac(7880).
							E(level): from (p,p').
							J ^π : from model-dependent PWBA in (e,e').
							B(M1)↑=0.08 3 from (e,e') (1990Gu09).
7969 4	1 [‡]			P			
7986	2 ⁺		M		Y		XREF: M(7996)Y(7986).
							E(level): from (α,α').
							J ^π : L(α,α')=2 from 0 ⁺ ; L(d,p)=1+3 from 5/2 ⁻ .
7999 10	3 ⁻				U		J ^π : L(p,p')=3 from 0 ⁺ .
8010 4	1 [‡]		m P				
8052 10	1 ⁺ ,3 ⁺		M Q U				XREF: Q(8059).
							E(level): weighted average of 8046 12 from (d,p) and 8057 10 from (p,p').
							J ^π : from model-dependent PWBA in (e,e').
							B(M1)↑=0.09 3, B(M3)↑=0.084 19 from (e,e').
8090? 10			M		U		E(level): weighted average of 8086 12 from (d,p) and 8093 10 from (p,p') This level could be a different level from the 8091 level from (α,pγ). See comment for 8091 level.
8092.1 14	12,10,8,6	0.21 ps 7	F J m u				J ^π : from pγ(θ) in (α,pγ). Excitation in (α,pγ) is consistent with prediction (1978Ku16) of a single 12 ⁺ state near 8 MeV, which could indicate 8093 10 from (p,p') and 8086 12 from (d,p) are different levels from this one.
							T _{1/2} : from DSAM in (¹⁴ C,2nγ).
8199 4	1 ⁺		PQ U				XREF: Q(8197)U(8178).
							J ^π : 1,2 from γ(θ) and azimuthal asymmetries in

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

⁴⁸ Ti Levels (continued)					
E(level) [†]	J ^π	T _{1/2} [@]	XREF		Comments
					(γ,γ); 1 ⁺ ,3 ⁺ from model-dependent PWBA in (e,e').
					B(M1) $\uparrow$ =0.24 9 from model-dependent PWBA in (e,e') (1990Gu09).
8212 10	3 ⁻			U	J ^π : L(p,p')=3 from 0 ⁺ .
8246 10	(2 ⁺)			U	J ^π : L(p,p')=(2) from 0 ⁺ .
8255 4	1 ^{$\frac{1}{2}$}		P	U	
8323.9 12	10,8,6		IJ		J ^π : from $p\gamma(\theta)$ in ($\alpha,p\gamma$).
8572 4	1 ⁽⁻⁾ ^{$\frac{1}{2}$}		P		
8592 4	1 ^{$\frac{1}{2}$}		P		
8672 5	1 ^{$\frac{1}{2}$}		P		
8933 5	1 ^{$\frac{1}{2}$}		P		
8996 5	1 ⁽⁺⁾ ^{$\frac{1}{2}$}		P		
9025 5	1 ^{$\frac{1}{2}$}		P		
9260				U	
9910				U	
9977 6	1 ⁻ ^{$\frac{1}{2}$}		P		
10460				U	
1.060×10 ⁴ 5					XREF: Others: AC
10726? 6	(6 ⁺)				XREF: Others: AC
					T=(3)
10982 6	(4 ⁺)				J ^π ,T: suggested analog state in (p,t).
					XREF: Others: AC
					T=(3)
1.68×10 ⁴ 3	(1 ⁻)	7.27 MeV +22-24			J ^π ,T: suggested analog state in (p,t).
					XREF: Others: AH
16.96×10 ³ 16	(2 ⁺)	3.72 MeV +60-46			T _{1/2} : width for giant dipole resonance.
					XREF: Others: AH
17379 12	(0 ⁺)		N		T _{1/2} : width for giant quadrupole resonance.
					XREF: Others: AC
					T=(4)
1.89×10 ⁴ 3	(0 ⁺)	4.5 MeV +13-2			E(level): from (p,t).
					J ^π ,T: suggested analog state in (p,t).
2.48×10 ⁴ 3	(3 ⁻)	7.25 MeV 20			XREF: Others: AH
					T _{1/2} : width for giant monopole resonance.
28.9×10 ³ 8	(1 ⁻)	12.44 MeV +56-68			T _{1/2} : width for giant octupole resonance.
					XREF: Others: AH
					T _{1/2} : width for giant dipole resonance.

[†] From a least-squares fit to γ -ray energies for levels connected with γ transitions, assuming $\Delta E\gamma=0.5$ keV and 1.0 keV for $E\gamma$ values quoted to nearest tenth keV and keV, respectively, where $\Delta E\gamma$ not given, and from transfer reactions in other cases, unless otherwise noted.

[‡] From $\gamma(\theta)$ and azimuthal asymmetries in (γ,γ').

If J(8091)=12 then J(7374)=11, J(7668,6906,6102)=10, and J(7427,6034)=9.

@ From DSAM in ($\alpha,p\gamma$) (1979Gl07), unless otherwise noted..

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$									Comments
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	δ	$\alpha^\ddagger$	
983.531	2 ⁺	983.521 4	100	0.0	0 ⁺	E2		0.0001261 18	B(E2)(W.u.)=13.2 +13-11 $\alpha=0.0001261$ 18; $\alpha(\text{K})=0.0001145$ 16; $\alpha(\text{L})=1.025\times 10^{-5}$ 14; $\alpha(\text{M})=1.311\times 10^{-6}$ 18 $\alpha(\text{N})=7.10\times 10^{-8}$ 10 E_γ : weighted average of 983.526 12 from ^{48}Sc β^- decay, 983.525 4 from ^{48}V ε decay, and 983.517 4 from (n, γ) E=thermal. Others: 983.4 3 from (^{14}C ,2n γ), 983.7 5 from (^7Li ,p2n γ), 983.1 3 from (α ,p γ), 983.50 15 from (p,p' γ), and 983.1 15 from Coulomb excitation. Mult.: from ce data in ε and β^- decay, $\gamma(\theta,\text{pol})$ in (p,p' γ), and $\gamma\gamma(\theta)$ in (n, γ) E=thermal.
2295.648	4 ⁺	1312.104 6	100	983.531	2 ⁺	E2		9.66 $\times 10^{-5}$ 14	B(E2)(W.u.)=16.1 +28-21 $\alpha=9.66\times 10^{-5}$ 14; $\alpha(\text{K})=5.89\times 10^{-5}$ 8; $\alpha(\text{L})=5.26\times 10^{-6}$ 7; $\alpha(\text{M})=6.73\times 10^{-7}$ 9 $\alpha(\text{N})=3.65\times 10^{-8}$ 5; $\alpha(\text{IPF})=3.17\times 10^{-5}$ 4 E_γ : weighted average of 1312.120 12 from ^{48}Sc β^- decay, 1312.105 6 from ^{48}V ε decay, and 1312.096 7 from (n, γ) E=thermal. Others: 1312.1 6 from (^{14}C ,2n γ), 1312.5 7 from (^7Li ,p2n γ), 1311.7 3 from (α ,p γ), and 1312.20 10 from (p,p' γ). Mult.: from ce data in ε and β^- decay, $\gamma(\theta)$ in (p,p' γ), and $\gamma\gamma(\theta)$ in (n, γ) E=thermal.
2421.053	2 ⁺	1437.493 13	100.0 10	983.531	2 ⁺	M1+E2	+0.15 3	9.50 $\times 10^{-5}$ 14	B(M1)(W.u.)=0.226 +19-16; B(E2)(W.u.)=6.1 +27-22 $\alpha=9.50\times 10^{-5}$ 14; $\alpha(\text{K})=4.22\times 10^{-5}$ 6; $\alpha(\text{L})=3.76\times 10^{-6}$ 5; $\alpha(\text{M})=4.82\times 10^{-7}$ 7 $\alpha(\text{N})=2.62\times 10^{-8}$ 4; $\alpha(\text{IPF})=4.85\times 10^{-5}$ 7 E_γ : weighted average of 1437.521 21 from ^{48}V ε decay and 1437.487 10 from (n, γ) E=thermal. Others: 1436.9 5 from (α ,p γ) and 1436.80 10 from (p,p' γ). I_γ : from (p,p' γ). Others: 100.0 25 from ^{48}V ε decay, 100 6 from (n, γ) E=thermal, 100 5 from (n,n' γ), and 100.0 2 from (α ,p γ). Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,p' γ) and (n, γ) E=thermal, and $\gamma(\theta)$ in (n,n' γ); E1+M2 ruled out by RUL. δ : weighted average of +0.18 3 in (n,n' γ), +0.10 4 in (n, γ) E=thermal, and +0.18 9 from (p,p' γ).
		2420.91 4	5.43 25	0.0	0 ⁺	E2		0.000539 8	B(E2)(W.u.)=1.12 10 $\alpha=0.000539$ 8; $\alpha(\text{K})=1.821\times 10^{-5}$ 25; $\alpha(\text{L})=1.620\times 10^{-6}$ 23; $\alpha(\text{M})=2.073\times 10^{-7}$ 29 $\alpha(\text{N})=1.130\times 10^{-8}$ 16; $\alpha(\text{IPF})=0.000519$ 7 E_γ : weighted average of 2420.94 5 from ^{48}V ε decay,

Adopted Levels, Gammas (continued)

<u>$\gamma(^{48}\text{Ti})$ (continued)</u>									
<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_{γ}^{$\ddagger$}</u>	<u>I_{γ}^{$\ddagger$}</u>	<u>E_f</u>	<u>J_f^{π}</u>	<u>Mult.</u>	<u>δ</u>	<u>$\alpha^{\dagger}$</u>	<u>Comments</u>
2997.31	0 ⁺	2013.79 17	100	983.531	2 ⁺	(E2)		0.000348 5	2420.90 4 from (n, γ) E=thermal, and 2420.70 20 from (p,p' γ). I _{γ} : weighted average of 5.58 25 from ⁴⁸ V ε decay, 5.42 36 from (n, γ) E=thermal, 5.0 12 from (n,n' γ), and 3.5 10 from (p,p' γ). Other: 1.0 2 from (α ,p γ) is discrepant. Mult.: Q from p γ (θ) and γ (θ) in (p,p' γ); M2 ruled out by RUL. B(E2)(W.u.)=20.6 +44-32 α =0.000348 5; α (K)=2.519 $\times 10^{-5}$ 35; α (L)=2.244 $\times 10^{-6}$ 31; α (M)=2.87 $\times 10^{-7}$ 4 α (N)=1.563 $\times 10^{-8}$ 22; α (IPF)=0.000320 4 E _{γ} : weighted average of 2013.66 16 from (n, γ) E=thermal and 2014.00 20 from (p,p' γ). Mult.: isotropic p γ (θ) in (p,p' γ); M2 ruled out by RUL.
3223.971	3 ⁺	802.88 6	5.0 3	2421.053	2 ⁺	[M1,E2]		0.000177 35	B(M1)(W.u.)=0.047 +11-8 (if pure M1); B(E2)(W.u.)=179 +41-29 (if pure E2) α =0.000177 35; α (K)=0.000161 32; α (L)=1.44 $\times 10^{-5}$ 29; α (M)=1.8 $\times 10^{-6}$ 4 α (N)=1.00 $\times 10^{-7}$ 20 E _{γ} : weighted average of 803.05 25 from ⁴⁸ V ε decay, 802.87 6 from (n, γ) E=thermal, and 804.0 12 from (p,p' γ). I _{γ} : weighted average of 5.83 52 from ⁴⁸ V ε decay, 5.5 14 from (α ,p γ), 4.55 33 from (n, γ) E=thermal, and 5.1 11 from (p,p' γ). Other: 9.0 50 from (n,n' γ). B(M1)(W.u.)=0.202 +47-33; B(E2)(W.u.)<1.2 α =0.0001061 15; α (K)=9.64 $\times 10^{-5}$ 13; α (L)=8.61 $\times 10^{-6}$ 12; α (M)=1.102 $\times 10^{-6}$ 15 α (N)=5.99 $\times 10^{-8}$ 8 E _{γ} : unweighted average of 928.326 6 from ⁴⁸ V ε decay and 928.290 10 from (n, γ) E=thermal. Others: 928.4 6 from (p,p' γ); 927.4 7 from (α ,p γ) is discrepant. I _{γ} : from ⁴⁸ V ε decay. Others: 31.5 41 from (α ,p γ), 31.8 17 from (n, γ) E=thermal, 35.0 60 from (n,n' γ), and 33.8 24 from (p,p' γ). Mult., δ : D(+Q) from γ (θ) in (p,p' γ); $\Delta\pi$ =no from level scheme.
		928.316 16	33.56 13	2295.648	4 ⁺	(M1(+E2))	-0.02 2	0.0001061 15	
		2240.391 10	100.0 6	983.531	2 ⁺	M1+E2	+0.26 3	0.000379 5	B(M1)(W.u.)=0.040 +9-6; B(E2)(W.u.)=1.34 +46-33 α =0.000379 5; α (K)=1.961 $\times 10^{-5}$ 28; α (L)=1.745 $\times 10^{-6}$ 24; α (M)=2.232 $\times 10^{-7}$ 31 α (N)=1.217 $\times 10^{-8}$ 17; α (IPF)=0.000357 5 E _{γ} : weighted average of 2240.396 10 from ⁴⁸ V ε decay and 2240.375 19 from (n, γ) E=thermal. Others: 2240.2 7 from

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									Comments
$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	
3239.771	4 ⁺	944.118 12	100	2295.648	4 ⁺	M1+E2	-0.30 5	0.0001057 18	($\alpha, p\gamma$) and 2240.0 3 from (p,p' γ). I $_\gamma$: from ⁴⁸ V ε decay. Others: 100 6 from ($\alpha, p\gamma$), 100 6 from (n, γ) E=thermal, 100 15 from (n,n' γ), and 100 3 from (p,p' γ). Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ) and $p\gamma(\theta)$ in (p,p' γ); E1+M2 ruled out by RUL. δ : from $\gamma(\theta)$ in (n,n' γ). Other: +0.26 5 from $p\gamma(\theta)$ in (p,p' γ). B(M1)(W.u.)=0.52 +17-10; B(E2)(W.u.)=131 +64-43 α =0.0001057 18; α (K)=9.60 $\times 10^{-5}$ 16; α (L)=8.58 $\times 10^{-6}$ 14; α (M)=1.097 $\times 10^{-6}$ 18 α (N)=5.97 $\times 10^{-8}$ 10 E $_\gamma$: unweighted average of 944.129 6 from ⁴⁸ V ε decay and 944.104 7 from (n, γ) E=thermal. Others: 943.6 5 from ($\alpha, p\gamma$) and 945.1 5 from (p,p' γ) are discrepant. Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); E1+M2 ruled out by RUL. δ : from $\gamma(\theta)$ in (n,n' γ). B(E2)(W.u.)=5.1 +5-4 α =0.0001108 16; α (K)=0.0001006 14; α (L)=9.00 $\times 10^{-6}$ 13; α (M)=1.151 $\times 10^{-6}$ 16 α (N)=6.23 $\times 10^{-8}$ 9 E $_\gamma$: weighted average of 1037.522 12 from ⁴⁸ Sc β^- decay, 1037.0 5 from (¹⁴ C,2n γ), 1037.9 5 from (⁷ Li,p2n γ), 1037.1 4 from ($\alpha, p\gamma$), and 1037.599 25 from (n, γ) E=thermal. Mult.: Q from $p\gamma(\theta)$ in ($\alpha, p\gamma$); M2 ruled out by RUL. B(E1)(W.u.)=4.8 $\times 10^{-5}$ +21-18 α =5.98 $\times 10^{-5}$ 8; α (K)=5.43 $\times 10^{-5}$ 8; α (L)=4.84 $\times 10^{-6}$ 7; α (M)=6.19 $\times 10^{-7}$ 9 α (N)=3.36 $\times 10^{-8}$ 5 E $_\gamma$: from (n,n' γ) and ($\alpha, p\gamma$). I $_\gamma$: from ($\alpha, p\gamma$). Other: 8 3 from (n,n' γ) is discrepant. Note that this transition is not seen in ε decay, (p,p' γ) and (n, γ) E=thermal, indicating a weak intensity. B(E1)(W.u.)=3.0 $\times 10^{-4}$ +7-5 α =4.69 $\times 10^{-5}$ 7; α (K)=4.26 $\times 10^{-5}$ 6; α (L)=3.80 $\times 10^{-6}$ 5; α (M)=4.85 $\times 10^{-7}$ 7 α (N)=2.64 $\times 10^{-8}$ 4 E $_\gamma$: unweighted average of 1063.9 1 from ⁴⁸ V ε decay, 1063.19 5 from (n, γ) E=thermal, and 1064.0 10 from (p,p' γ). I $_\gamma$: unweighted average of 8.2 17 from ($\alpha, p\gamma$), 10.3 8 from
3333.187	6 ⁺	1037.536 18	100	2295.648	4 ⁺	E2		0.0001108 16	
3358.823	3 ⁻	938.0	1.7 6	2421.053	2 ⁺	[E1]		5.98 $\times 10^{-5}$ 8	
		1063.7 3	15.2 4	2295.648	4 ⁺	[E1]		4.69 $\times 10^{-5}$ 7	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	δ	$\alpha^\ddagger$	Comments
3358.823	3 ⁻	2375.209 19	100.0 8	983.531	2 ⁺	(E1(+M2))	0.00 3	0.000902 13	(n, γ) E=thermal, 23 8 from (n,n' γ), and 17.4 8 from (p,p' γ). Other: 57 12 from ^{48}V ε decay is strongly discrepant with other values. B(E1)(W.u.)= 1.76×10^{-4} +40-30; B(M2)(W.u.)<0.26 α =0.000902 13; α (K)= 1.174×10^{-5} 16; α (L)= 1.043×10^{-6} 15; α (M)= 1.334×10^{-7} 19 α (N)= 7.27×10^{-9} 10; α (IPF)=0.000889 12 E_γ : weighted average of 2375.20 4 from ^{48}V ε decay and 2375.211 19 from (n, γ) E=thermal. Others: 2374.7 4 from (α ,p γ) and 2374.8 8 from (p,p' γ). I_γ : from (p,p' γ). Others: 100.0 35 from ^{48}V ε decay, 100.0 22 from (α ,p γ), 100 6 from (n, γ) E=thermal, and 100 23 from (n,n' γ). Mult., δ : D(+Q) from $\gamma(\theta)$ in (n,n' γ) with δ =0.00 3 and p $\gamma(\theta)$ in (p,p' γ) with δ =0.00 4; $\Delta\pi$ =yes from level scheme. B(M1)(W.u.)=0.120 16; B(E2)(W.u.)=2.1 +26-15 α =0.000438 7; α (K)= 1.764×10^{-5} 25; α (L)= 1.569×10^{-6} 22; α (M)= 2.008×10^{-7} 29 α (N)= 1.095×10^{-8} 16; α (IPF)=0.000418 7 E_γ : from (n, γ) E=thermal. Others: 2387.6 5 from (α ,p γ) and 2387.3 3 from (p,p' γ). I_γ : from (p,p' γ). Others: 100.0 34 from (α ,p γ), 100 6 from (n, γ) E=thermal, and 100 15 from (n,n' γ). Mult.: D+Q from $\gamma\gamma(\theta)$ in (n, γ) E=thermal, $\gamma(\theta)$ in (γ , γ') and p $\gamma(\theta)$ in (p,p' γ); $\Delta\pi$ =no from level scheme. δ : from combination of -0.2 1 or 4 1 from (p,p' γ), <0.5 from (n, γ) E=thermal, and 0.1< δ <0.8 from (γ , γ'). B(E2)(W.u.)=1.59 +24-20 α =0.000950 13; α (K)= 1.064×10^{-5} 15; α (L)= 9.46×10^{-7} 13; α (M)= 1.210×10^{-7} 17 α (N)= 6.60×10^{-9} 9; α (IPF)=0.000938 13 E_γ : from (n, γ) E=thermal. Others: 3369.6 14 from (α ,p γ) and 3371.5 12 from (p,p' γ). I_γ : weighted average of 12.4 34 from (α ,p γ), 19.0 15 from (n, γ) E=thermal, 20 5 from (n,n' γ), and 15.6 11 from (p,p' γ). B(M1)(W.u.)=1.6 +6-4 α (K)=0.00407 6; α (L)=0.000371 5; α (M)= 4.74×10^{-5} 7 α (N)= 2.54×10^{-6} 4 E_γ : from ^{48}Sc β^- decay. Others: 175.3 3 from (^{14}C ,2n γ) and 175.9 5 from (^7Li ,p2n γ). I_γ : from ^{48}Sc β^- decay. Others: 100 11 from (^{24}Mg ,3p γ), 100 4 from (α ,p γ), and 100 5 from (^3He ,3n γ). Mult.: assumed based on comparions with RUL.
3370.87	2 ⁺	2387.25 3	100.0 12	983.531	2 ⁺	(M1+E2)	-0.2 1	0.000438 7	
		3370.96 13	16.6 11	0.0	0 ⁺	[E2]		0.000950 13	
3508.548	6 ⁺	175.361 5	100.0 12	3333.187	6 ⁺	[M1]		0.00449 6	

Adopted Levels, Gammas (continued)

<u>$\gamma(^{48}\text{Ti})$ (continued)</u>									
<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_{γ}^{$\ddagger$}</u>	<u>I_{γ}^{$\ddagger$}</u>	<u>E_f</u>	<u>J_f^{π}</u>	<u>Mult.</u>	<u>δ</u>	<u>$\alpha^{\ddagger}$</u>	<u>Comments</u>
3508.548	6 ⁺	1212.880 12	31.8 6	2295.648	4 ⁺	E2		8.83×10 ⁻⁵ 12	B(E2)(W.u.)=2.6 +9-6 α =8.83×10 ⁻⁵ 12; α (K)=7.00×10 ⁻⁵ 10; α (L)=6.26×10 ⁻⁶ 9; α (M)=8.00×10 ⁻⁷ 11 α (N)=4.34×10 ⁻⁸ 6; α (IPF)=1.120×10 ⁻⁵ 16 E _{γ} : from ⁴⁸ Sc β ⁻ decay. Others: 1212.4 10 from (⁷ Li,p2n γ) and 1212.3 6 from (α ,p γ). I _{γ} : weighted average of 31.86 54 from ⁴⁸ Sc β ⁻ decay, 29.9 39 from (α ,p γ), and 27 10 from (³ He,3n γ). Others: 20.1 30 from (²⁴ Mg,3p γ) is discrepant. Mult.: Q from p γ (θ) in (α ,p γ); M2 ruled out by RUL. B(M1)(W.u.)=0.022 +9-5 (if pure M1); B(E2)(W.u.)=38 +16-9 (if pure E2) α =8.0×10 ⁻⁵ 9; α (K)=6.6×10 ⁻⁵ 7; α (L)=5.9×10 ⁻⁶ 6; α (M)=7.5×10 ⁻⁷ 8 α (N)=4.1×10 ⁻⁸ 4; α (IPF)=7.2×10 ⁻⁶ 14 E _{γ} : from (n, γ) E=thermal. I _{γ} : weighted average of 10.2 23 from (α ,p γ) and 7.96 54 from (n, γ) E=thermal. B(M1)(W.u.)=0.025 +11-6; B(E2)(W.u.)=0.20 +16-10 α =0.000540 8; α (K)=1.505×10 ⁻⁵ 21; α (L)=1.339×10 ⁻⁶ 19; α (M)=1.713×10 ⁻⁷ 24 α (N)=9.34×10 ⁻⁹ 13; α (IPF)=0.000523 7 E _{γ} : from (n, γ) E=thermal. Other: 2632.5 8 from (α ,p γ). I _{γ} : from (α ,p γ). Other: 100 7 from (n, γ) E=thermal. Mult.: D+Q from $\gamma\gamma$ (θ) in (n, γ) E=thermal and p γ (θ) in (p,p' γ); E1+M2 ruled out by RUL. δ : weighted average of -0.10 5 from $\gamma\gamma$ (θ) in (n, γ) E=thermal and -0.18 4 from p γ (θ) in (p,p' γ). B(E2)(W.u.)=0.041 +32-20 α (K)=9.55×10 ⁻⁶ 13; α (L)=8.49×10 ⁻⁷ 12; α (M)=1.086×10 ⁻⁷ 15 α (N)=5.93×10 ⁻⁹ 8; α (IPF)=0.001034 14 E _{γ} : from (n, γ) E=thermal. I _{γ} : unweighted average of 3.4 11 from (α ,p γ) and 1.08 43 from (n, γ) E=thermal. B(E1)(W.u.)=0.00143 +33-23 α (K)=9.78×10 ⁻⁶ 14; α (L)=8.69×10 ⁻⁷ 12; α (M)=1.111×10 ⁻⁷ 16 α (N)=6.06×10 ⁻⁹ 8; α (IPF)=0.001090 15 E _{γ} : from (n, γ) E=thermal. Other: 2716 1 from (γ , γ), 2714.9 from (p,p' γ). I _{γ} : from (p,p' γ). Others: 100 13 from (α ,p γ), 100 8 from
3616.812	2 ⁺	1195.83 6	8.1 6	2421.053	2 ⁺	[M1,E2]		8.0×10 ⁻⁵ 9	
		2633.20 3	100 4	983.531	2 ⁺	M1+E2	-0.15 4	0.000540 8	
		3616.8 8	2.2 12	0.0	0 ⁺	[E2]		1.04×10 ⁻³ 2	
3699.52	1 ⁽⁻⁾	2715.81 13	100 3	983.531	2 ⁺	(E1)&		1.10×10 ⁻³ 2	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	δ	$\alpha^\ddagger$	Comments
									(n, γ) E=thermal, 100 6 from (γ,γ), and 100 15 from (n,n' γ). Mult.: from $\gamma(\theta)$ and azimuthal asymmetries in (γ,γ'). Other: M1+E2 with $\delta=+0.9$ +14-5 from $p\gamma(\theta)$ and comparison to RUL in (p,p' γ) is discrepant.
3699.52	1 ⁽⁻⁾	3699.11 12	58 4	0.0	0 ⁺	(E1)&		1.57×10 ⁻³ 2	B(E1)(W.u.)=3.3×10 ⁻⁴ +8-6 $\alpha(K)=6.57\times 10^{-6}$ 9; $\alpha(L)=5.83\times 10^{-7}$ 8; $\alpha(M)=7.46\times 10^{-8}$ 10 $\alpha(N)=4.07\times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001559$ 22 E_γ : from (n, γ) E=thermal. Other: 3700 1 from (γ,γ), 3698.3 from (p,p' γ). I_γ : weighted average of 61 13 from ($\alpha,p\gamma$), 67 5 from (n, γ) E=thermal, 54 8 from (n,n' γ), and 53.8 31 from (p,p' γ). Other: 92 6 from (γ,γ') is discrepant. E_γ : from ($\alpha,p\gamma$) only. 1993Ko57 in (n,n' γ) suggest that this γ is the same as the 2726 γ from the 5146 state in their work.
3711.6?		2728 ^a	100	983.531	2 ⁺				E_γ, I_γ : reported in (p,p' γ) (1968Mo20) only; energy from level-energy difference.
3738.60	1 ⁺	1317.2 ^a	12 3	2421.053	2 ⁺				B(M1)(W.u.)=0.08 +20-8; B(E2)(W.u.)<74 $\alpha=0.00060$ 7; $\alpha(K)=1.41\times 10^{-5}$ 5; $\alpha(L)=1.25\times 10^{-6}$ 4; $\alpha(M)=1.60\times 10^{-7}$ 6 $\alpha(N)=8.74\times 10^{-9}$ 30; $\alpha(\text{IPF})=0.00059$ 7 E_γ : weighted average of 2756.5 7 from (n, γ) E=thermal and 2755 1 from (γ,γ). Other: 2757.2 from (p,p' γ). I_γ : weighted average of 63 15 from (n, γ) E=thermal, 42 10 from (n,n' γ), and 42 8 from (p,p' γ). Other: I(2756 γ)/3738 γ =257 22/100 22 is discrepant.
		2756.0 7	45 8	983.531	2 ⁺	(M1(+E2))	-0.4 +5-17	0.00060 7	Mult., δ : D(+Q) and δ from $p\gamma(\theta)$ in (p,p' γ) and (M1) from azimuthal asymmetries in (γ,γ').
		3738.35 24	100 8	0.0	0 ⁺	M1&		0.000961 13	B(M1)(W.u.)=0.09 +9-3 $\alpha=0.000961$ 13; $\alpha(K)=8.80\times 10^{-6}$ 12; $\alpha(L)=7.82\times 10^{-7}$ 11; $\alpha(M)=1.000\times 10^{-7}$ 14 $\alpha(N)=5.46\times 10^{-9}$ 8; $\alpha(\text{IPF})=0.000951$ 13 E_γ : from (n, γ) E=thermal. Others: 3737.8 13 from ($\alpha,p\gamma$), 3739 1 from (γ,γ), 3740.5 from (p,p' γ). I_γ : from (p,p' γ). Others: 100 12 from (n, γ) E=thermal, 100 16 from (n,n' γ).
3782.459	3 ⁻ ,4 ⁻	423.629 10	100 5	3358.823	3 ⁻	[M1+E2]		1.0×10 ⁻³ 5	B(M1)(W.u.)=0.17 +16-8 (if pure M1) $\alpha(K)=9.E-4$ 4; $\alpha(L)=8.E-5$ 4; $\alpha(M)=1.1\times 10^{-5}$ 5 $\alpha(N)=5.8\times 10^{-7}$ 26 E_γ : weighted average of 423.2 4 from ($\alpha,p\gamma$) and

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
3782.459	3 ⁻ ,4 ⁻	558.6	4.1 14	3223.971	3 ⁺	[E1]		0.0001887 26	423.629 9 from (n, γ) E=thermal. I $_\gamma$: from (n, γ) E=thermal. Other: 100 6 from (α ,p γ); I(424 γ)/I(1487 γ) $\approx$ 50/100 25 in (n,n' γ) and 23 5/100 5 in (p,p' γ) are discrepant. Mult., δ : D+Q, -0.24 14 or <-3.7, if J=4 from $\gamma\gamma(\theta)$ in (n, γ) E=thermal. Pure E2 ruled out by RUL. B(E1)(W.u.)=7 $\times$ 10 ⁻⁵ +8-4 α =0.0001887 26; α (K)=0.0001713 24; α (L)=1.532 $\times$ 10 ⁻⁵ 21; α (M)=1.958 $\times$ 10 ⁻⁶ 27 α (N)=1.059 $\times$ 10 ⁻⁷ 15 E $_\gamma$: from (n,n' γ). I $_\gamma$: from (α ,p γ). Other: I(559 γ)/I(1487 γ)=50 15/100 25 in (n,n' γ) is discrepant. B(E1)(W.u.)=3.6 $\times$ 10 ⁻⁵ +36-17 α =0.000278 4; α (K)=2.369 $\times$ 10 ⁻⁵ 33; α (L)=2.109 $\times$ 10 ⁻⁶ 30; α (M)=2.70 $\times$ 10 ⁻⁷ 4 α (N)=1.467 $\times$ 10 ⁻⁸ 21; α (IPF)=0.0002520 35 E $_\gamma$: from (n, γ) E=thermal. Other: 1486.8 17 from (α ,p γ). I $_\gamma$: weighted average of 33 6 from (α ,p γ) and 41.5 24 from (n, γ) E=thermal. E $_\gamma$: from (n, γ) E=thermal only.
		1486.82 3	40 3	2295.648	4 ⁺	[E1]		0.000278 4	B(E1)(W.u.)=2.8 $\times$ 10 ⁻⁴ +9-7 α =0.0002389 33; α (K)=2.520 $\times$ 10 ⁻⁵ 35; α (L)=2.244 $\times$ 10 ⁻⁶ 31; α (M)=2.87 $\times$ 10 ⁻⁷ 4 α (N)=1.561 $\times$ 10 ⁻⁸ 22; α (IPF)=0.0002112 30 E $_\gamma$: from (α ,p γ) and (n,n' γ). I $_\gamma$: from (α ,p γ). Other: $\approx$ 2.5 from (n,n' γ). B(E1)(W.u.)=0.00080 +19-14 α =0.000331 5; α (K)=2.200 $\times$ 10 ⁻⁵ 31; α (L)=1.958 $\times$ 10 ⁻⁶ 27; α (M)=2.504 $\times$ 10 ⁻⁷ 35 α (N)=1.363 $\times$ 10 ⁻⁸ 19; α (IPF)=0.000307 4 E $_\gamma$: from (n, γ) E=thermal. Other: 1556.6 in (n,n' γ), 1556.3 in (p,p' γ). I $_\gamma$: weighted average of 26.7 40 from (α ,p γ), 24.0 15 from (n, γ) E=thermal, and 37.0 69 from (p,p' γ). B(E1)(W.u.)=0.00052 +12-8; B(M2)(W.u.)<0.23 α (K)=9.10 $\times$ 10 ⁻⁶ 13; α (L)=8.08 $\times$ 10 ⁻⁷ 11; α (M)=1.033 $\times$ 10 ⁻⁷ 14 α (N)=5.63 $\times$ 10 ⁻⁹ 8; α (IPF)=0.001175 16 E $_\gamma$: weighted average of 2866.7 13 from (α ,p γ) and 2868.59 4 from (n, γ) E=thermal. I $_\gamma$: from (α ,p γ). Others: 100 6 from (n, γ) E=thermal
3802.73	2 ⁻	2819.08 13	100	983.531	2 ⁺				
3852.24	3 ⁻	1432 [#]	6.7 13	2421.053	2 ⁺	[E1]		0.0002389 33	
		1556.57 5	24.8 19	2295.648	4 ⁺	[E1]		0.000331 5	
		2868.59 6	100 4	983.531	2 ⁺	(E1(+M2))	0.00 2	1.18 $\times$ 10 ⁻³ 2	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
4035.153	2 ⁺	811.198 17	44.7 25	3223.971	3 ⁺	[M1+E2]		0.000173 34	and 100 7 from (p,p' γ). Mult., δ : D(+Q) and δ from $\text{py}(\theta)$ in (p,p' γ); $\Delta\pi$ =yes from level scheme. α =0.000173 34; α (K)=0.000157 31; α (L)=1.41 $\times 10^{-5}$ 28; α (M)=1.8 $\times 10^{-6}$ 4 α (N)=9.7 $\times 10^{-8}$ 19 B(M1)(W.u.)=0.58 +56-23 (if pure M1) E_γ : from (n, γ) E=thermal. Other: 811 3 from (n,n' γ). I_γ : weighted average of 56.3 94 from (α ,py), 44.2 25 from (n, γ) E=thermal, and 41.0 90 from (n,n' γ). Mult.: pure E2 ruled out by RUL. B(M1)(W.u.)=0.16 +16-6 (if pure M1); B(E2)(W.u.)=1.6 $\times 10^2$ +15-6 (if pure E2) α =0.000158 19; α (K)=3.63 $\times 10^{-5}$ 21; α (L)=3.23 $\times 10^{-6}$ 19; α (M)=4.14 $\times 10^{-7}$ 25 α (N)=2.25 $\times 10^{-8}$ 13; α (IPF)=0.000118 17 E_γ : from (n, γ) E=thermal. Others: 1614.3 13 from (α ,py), 1614 4 from (n,n' γ), and 1615.1 11 from (p,p' γ). I_γ : from (n, γ) E=thermal. Others: 100 10 from (α ,py) and 100 15 from (n,n' γ). B(E1)(W.u.)=0.00023 +11-6 α =0.0001062 15; α (K)=9.65 $\times 10^{-5}$ 14; α (L)=8.61 $\times 10^{-6}$ 12; α (M)=1.101 $\times 10^{-6}$ 15 α (N)=5.97 $\times 10^{-8}$ 8 B(E1)(W.u.)=0.00024 +11-7 α =8.14 $\times 10^{-5}$ 11; α (K)=7.39 $\times 10^{-5}$ 10; α (L)=6.60 $\times 10^{-6}$ 9; α (M)=8.43 $\times 10^{-7}$ 12 α (N)=4.57 $\times 10^{-8}$ 6 B(E1)(W.u.)=0.00022 +11-6 α =0.000477 8; α (K)=1.84 $\times 10^{-5}$ 4; α (L)=1.63 $\times 10^{-6}$ 4; α (M)=2.09 $\times 10^{-7}$ 5 α (N)=1.138 $\times 10^{-8}$ 27; α (IPF)=0.000457 8 E_γ , I_γ : from (α ,py). Mult., δ : D(+Q) and δ from $\text{py}(\theta)$ in (α ,py); $\Delta\pi$ =(yes) from level scheme. Other: $\delta(4\rightarrow 4)=-0.32$ +16-25 in (α ,py) excluded by comparison to RUL assuming $\Delta\pi$ =yes. α =0.0001917 27; α (K)=0.0001740 24; α (L)=1.561 $\times 10^{-5}$ 22; α (M)=1.995 $\times 10^{-6}$ 28
		1614.041 19	100 6	2421.053	2 ⁺	[M1,E2]		0.000158 19	
4046.6	5 ⁽⁻⁾	714	7.1 12	3333.187	6 ⁺	[E1]		0.0001062 15	
		807	10.6 24	3239.771	4 ⁺	[E1]		8.14 $\times 10^{-5}$ 11	
		1750.1 12	100 4	2295.648	4 ⁺	(E1(+M2))	-0.04 7	0.000477 8	
4074.511	2 ⁺	834.736 17	69 4	3239.771	4 ⁺	[E2]		0.0001917 27	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	$\alpha^\dagger$	Comments
4074.511	2 ⁺							$\alpha(\text{N})=1.077\times 10^{-7}$ 15 E_γ : from (n, γ) E=thermal. Other: 834.0 8 from (α ,p γ). I_γ : weighted average of 73.1 96 from (α ,p γ) and 68.2 39 from (n, γ) E=thermal. $B(\text{E}2)(\text{W.u.})=1.3\times 10^3$ +6-3 exceeds RUL=300.
		1779 ^{#a}	19 4	2295.648	4 ⁺	[E2]	0.0002431 34	$B(\text{E}2)(\text{W.u.})=8.2$ +42-24 $\alpha=0.0002431$ 34; $\alpha(\text{K})=3.17\times 10^{-5}$ 4; $\alpha(\text{L})=2.83\times 10^{-6}$ 4; $\alpha(\text{M})=3.62\times 10^{-7}$ 5
		3090.82 6	100 6	983.531	2 ⁺	[M1,E2]	0.00078 6	$\alpha(\text{N})=1.969\times 10^{-8}$ 28; $\alpha(\text{IPF})=0.0002081$ 29 $B(\text{M}1)(\text{W.u.})=0.0104$ +48-25 (if pure M1); $B(\text{E}2)(\text{W.u.})=2.7$ +13-7 (if pure E2) $\alpha=0.00078$ 6; $\alpha(\text{K})=1.195\times 10^{-5}$ 29; $\alpha(\text{L})=1.062\times 10^{-6}$ 26; $\alpha(\text{M})=1.359\times 10^{-7}$ 33
		4075.1 5	16 4	0.0	0 ⁺	[E2]	1.21 $\times 10^{-3}$ 2	$\alpha(\text{N})=7.41\times 10^{-9}$ 18; $\alpha(\text{IPF})=0.00076$ 6 E_γ : from (n, γ) E=thermal. Others: 3090.1 11 from (α ,p γ) and 3088 7 from (n,n' γ). I_γ : from (n, γ) E=thermal. Other: 100 12 from (α ,p γ). $B(\text{E}2)(\text{W.u.})=0.11$ +6-4 $\alpha(\text{K})=8.00\times 10^{-6}$ 11; $\alpha(\text{L})=7.11\times 10^{-7}$ 10; $\alpha(\text{M})=9.09\times 10^{-8}$ 13 $\alpha(\text{N})=4.96\times 10^{-9}$ 7; $\alpha(\text{IPF})=0.001197$ 17
4196.90	(2 ⁺)	346 [#]	22 5	3852.24	3 ⁻			E_γ : from (n, γ) E=thermal. I_γ : weighted average of 22 5 from (α ,p γ) and 27 5 from (n, γ) E=thermal.
		458.45 16	24 5	3738.60	1 ⁺			
4204.9	(1,2 ⁺)	496 [#]	13 3	3699.52	1 ⁽⁻⁾			E_γ : from (n, γ) E=thermal. I_γ : from (n, γ) E=thermal. Other: 100 10 from (α ,p γ). E_γ, I_γ : from (n, γ) E=thermal only.
		972.91 3	100 7	3223.971	3 ⁺			
		4196.63 13	63 5	0.0	0 ⁺			
4210	2 ⁻	4204.7 5	100	0.0	0 ⁺			$\alpha(\text{K})=7.81\times 10^{-6}$ 11; $\alpha(\text{L})=6.93\times 10^{-7}$ 10; $\alpha(\text{M})=8.87\times 10^{-8}$ 13 $\alpha(\text{N})=4.84\times 10^{-9}$ 7; $\alpha(\text{IPF})=0.001351$ 19 E_γ : from (n,n' γ).
4254.5	1 ⁺	3226 8	100	983.531	2 ⁺	[E1]	1.36 $\times 10^{-3}$ 2	
4311.3	1 ⁺	555	100	3699.52	1 ⁽⁻⁾	[E1]	0.0001917 27	$\alpha=0.0001917$ 27; $\alpha(\text{K})=0.0001741$ 24; $\alpha(\text{L})=1.556\times 10^{-5}$ 22; $\alpha(\text{M})=1.989\times 10^{-6}$ 28 $\alpha(\text{N})=1.076\times 10^{-7}$ 15
		1891	19 4	2421.053	2 ⁺			E_γ, I_γ : from (α ,p γ) only. E_γ : other: 3332 8 from (n,n' γ). I_γ : weighted average of 53 10 from (α ,p γ) and 45 22 from (n,n' γ).
		3328	52 10	983.531	2 ⁺			$B(\text{M}1)(\text{W.u.})=0.042$ +35-21 $\alpha(\text{K})=7.16\times 10^{-6}$ 10; $\alpha(\text{L})=6.36\times 10^{-7}$ 9; $\alpha(\text{M})=8.14\times 10^{-8}$ 11 $\alpha(\text{N})=4.44\times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001143$ 16
		4310 [@] 2	100 12	0.0	0 ⁺	M1 ^{&}	1.15 $\times 10^{-3}$ 2	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
									E_γ : from (γ,γ) . Other: 4314 9 from $(n,n'\gamma)$, 4312 from (α,py) . I_γ : from (α,py) . Other: 100 22 from $(n,n'\gamma)$.
4346.7	(2^+)	645 989	53 9 79 23	3699.52 3358.823	1 ⁽⁻⁾ 3 ⁻				
4381.4	$(3,4,5^-)$	3364 1142.3	100 19 45 7	983.531 3239.771	2 ⁺ 4 ⁺				E_γ : other: 3372 8 from $(n,n'\gamma)$. E_γ : from $(n,n'\gamma)$. I_γ : from (α,py) . Mult.: not pure E2 from comparison with RUL.
4387.691	4 ⁺	2086 1164.9 [#]	100 7 98 15	2295.648 3223.971	4 ⁺ 3 ⁺	[M1,E2]		8.0×10 ⁻⁵ 9	B(M1)(W.u.)=0.13 +8-4 (if pure M1); B(E2)(W.u.)=2.4×10 ² +14-7 (if pure E2) α =8.0×10 ⁻⁵ 9; α (K)=6.9×10 ⁻⁵ 7; α (L)=6.2×10 ⁻⁶ 7; α (M)=7.9×10 ⁻⁷ 8 α (N)=4.3×10 ⁻⁸ 5; α (IPF)=4.0×10 ⁻⁶ 8 E_γ : from $(n,n'\gamma)$. Other: 1165 from (α,py) ; not seen in (n,γ) E=thermal. I_γ : from (α,py) only.
		2092.007 19	85 5	2295.648	4 ⁺	[M1,E2]		0.00035 4	B(M1)(W.u.)=0.020 +12-6 (if pure M1); B(E2)(W.u.)=11 +7-3 (if pure E2) α =0.00035 4; α (K)=2.27×10 ⁻⁵ 9; α (L)=2.02×10 ⁻⁶ 8; α (M)=2.59×10 ⁻⁷ 10 α (N)=1.41×10 ⁻⁸ 5; α (IPF)=0.000324 35 E_γ : from (n,γ) E=thermal. Other: 2094 from (α,py) ; not seen in $(n,n'\gamma)$. I_γ : from (n,γ) E=thermal. Other: 20 4 from (α,py) is discrepant.
		3403.83 7	100 6	983.531	2 ⁺	[E2]		0.000963 13	B(E2)(W.u.)=1.1 +7-3 α =0.000963 13; α (K)=1.048×10 ⁻⁵ 15; α (L)=9.32×10 ⁻⁷ 13; α (M)=1.192×10 ⁻⁷ 17 α (N)=6.50×10 ⁻⁹ 9; α (IPF)=0.000951 13 E_γ : from (n,γ) E=thermal. Other: 3401 8 from $(n,n'\gamma)$, 3406 from (α,py) . I_γ : from (n,γ) E=thermal. Other: 100 13 from (α,py) . B(M1)(W.u.)=0.52 +30-20 α =0.000116 6; α (K)=0.000105 6; α (L)=9.4×10 ⁻⁶ 5; α (M)=1.20×10 ⁻⁶ 6 α (N)=6.54×10 ⁻⁸ 35 Mult., δ : D+Q and δ from $\text{py}(\theta)$ in (α,py) ; $\Delta\pi$ =no from level scheme.
4398.7	6 ⁺	890	100 7	3508.548	6 ⁺	(M1(+E2))	-0.1 3	0.000116 6	B(E2)(W.u.)=7.3 +35-21 α =0.000390 5; α (K)=2.329×10 ⁻⁵ 33; α (L)=2.075×10 ⁻⁶
		2103	33 7	2295.648	4 ⁺	[E2]		0.000390 5	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
4404.8	5 ⁽⁺⁾	1072	89 15	3333.187	6 ⁺	(M1(+E2))	-0.04 8	8.02×10 ⁻⁵ 12	29; $\alpha(\text{M})=2.65\times 10^{-7}$ 4 $\alpha(\text{N})=1.445\times 10^{-8}$ 20; $\alpha(\text{IPF})=0.000364$ 5 B(M1)(W.u.)>0.16 $\alpha=8.02\times 10^{-5}$ 12; $\alpha(\text{K})=7.28\times 10^{-5}$ 11; $\alpha(\text{L})=6.50\times 10^{-6}$ 9; $\alpha(\text{M})=8.32\times 10^{-7}$ 12 $\alpha(\text{N})=4.53\times 10^{-8}$ 7 Mult., δ : D(+Q) and δ from $\text{p}\gamma(\theta)$ in $(\alpha,\text{p}\gamma)$; $\Delta\pi=\text{no}$ from level scheme.
		2109	100 15	2295.648	4 ⁺	[M1,E2]		0.00036 4	$\alpha=0.00036$ 4; $\alpha(\text{K})=2.24\times 10^{-5}$ 9; $\alpha(\text{L})=1.99\times 10^{-6}$ 8; $\alpha(\text{M})=2.55\times 10^{-7}$ 10 $\alpha(\text{N})=1.39\times 10^{-8}$ 5; $\alpha(\text{IPF})=0.00033$ 4
4457.455	3 ⁺	840.66 3	8.0 5	3616.812	2 ⁺				I _γ : weighted average of 100 15 from $(\alpha,\text{p}\gamma)$ and 84 5 from (n,γ) E=thermal. I _γ : from (n,γ) E=thermal. Other: 100 15 from $(\alpha,\text{p}\gamma)$. B(M1)(W.u.)=0.0023 +19-8; B(E2)(W.u.)=0.007 +7-3 $\alpha=0.000868$ 12; $\alpha(\text{K})=9.81\times 10^{-6}$ 14; $\alpha(\text{L})=8.72\times 10^{-7}$ 12; $\alpha(\text{M})=1.116\times 10^{-7}$ 16 $\alpha(\text{N})=6.09\times 10^{-9}$ 9; $\alpha(\text{IPF})=0.000857$ 12 I _γ : weighted average of 50 10 from $(\alpha,\text{p}\gamma)$ and 56 5 from (n,γ) E=thermal. Mult.: D+Q from $\gamma\gamma(\theta)$ in (n,γ) E=thermal; $\Delta\pi=\text{no}$ from level scheme. δ : from $-0.13\leq\delta<-0.10$ from 3473.9γ-983.5γ(θ) and $+0.10\leq\delta<+0.13$ from 7168.7γ-3473.9γ(θ) in (n,γ) E=thermal.
		1086.51 8 1233.33 12 2036.349 13	4.9 4 2.61 25 86 5	3370.87 2 ⁺ 3223.971 3 ⁺ 2421.053 2 ⁺					
4564.8	8 ⁽⁺⁾	2161.759 14 3473.90 9	100 7 55 5	2295.648 4 ⁺ 983.531 2 ⁺		(M1+E2)	0.12 2	0.000868 12	
		1056.2 10	11.1 22	3508.548 6 ⁺		[E2]		0.0001061 15	B(E2)(W.u.)<1.4 $\alpha=0.0001061$ 15; $\alpha(\text{K})=9.64\times 10^{-5}$ 14; $\alpha(\text{L})=8.62\times 10^{-6}$ 12; $\alpha(\text{M})=1.103\times 10^{-6}$ 16 $\alpha(\text{N})=5.97\times 10^{-8}$ 8 E _γ : from $^{44}\text{Ca}(^7\text{Li},\text{p}2\text{n}\gamma)$. I _γ : from $(\alpha,\text{p}\gamma)$. B(E2)(W.u.)<5 $\alpha=8.90\times 10^{-5}$ 12; $\alpha(\text{K})=6.77\times 10^{-5}$ 9; $\alpha(\text{L})=6.05\times 10^{-6}$ 8; $\alpha(\text{M})=7.73\times 10^{-7}$ 11 $\alpha(\text{N})=4.20\times 10^{-8}$ 6; $\alpha(\text{IPF})=1.447\times 10^{-5}$ 22 E _γ : weighted average of 1231.4 6 from ($^{14}\text{C},2\text{n}\gamma$) and 1231.8 5 from ($^7\text{Li},\text{p}2\text{n}\gamma$). I _γ : from $(\alpha,\text{p}\gamma)$. Others: 100 20 from ($^{24}\text{Mg},3\text{p}\gamma$) and
		1231.6 5	100.0 22	3333.187 6 ⁺		(E2)		8.90×10 ⁻⁵ 12	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	$\alpha^\ddagger$	Comments
4580.69	3^-	1221.81 8	76 6	3358.823	3^-	[M1,E2]	8.0×10^{-5} 9	100 8 from ($^7\text{Li}, p2n\gamma$). Mult.: Q from $\text{py}(\theta)$ in (α, py). $\Delta J^\pi=2$, no from the level scheme. B(M1)(W.u.)=0.09 +7-3 (if pure M1); B(E2)(W.u.)= 1.5×10^2 +11-5 (if pure E2) $\alpha=8.0 \times 10^{-5}$ 9; $\alpha(\text{K})=6.3 \times 10^{-5}$ 6; $\alpha(\text{L})=5.6 \times 10^{-6}$ 6; $\alpha(\text{M})=7.2 \times 10^{-7}$ 7 $\alpha(\text{N})=3.9 \times 10^{-8}$ 4; $\alpha(\text{IPF})=1.07 \times 10^{-5}$ 20 I_γ : weighted average of 67 14 from (α, py) and 77.1 56 from (n, γ) E=thermal.
		2162 [#]	21 5	2421.053	2^+	[E1]	0.000766 11	B(E1)(W.u.)= 1.1×10^{-4} +8-4 $\alpha=0.000766$ 11; $\alpha(\text{K})=1.339 \times 10^{-5}$ 19; $\alpha(\text{L})=1.191 \times 10^{-6}$ 17; $\alpha(\text{M})=1.523 \times 10^{-7}$ 21 $\alpha(\text{N})=8.30 \times 10^{-9}$ 12; $\alpha(\text{IPF})=0.000752$ 11 E_γ : other: 2162 5 from (n,n' γ). B(E1)(W.u.)=0.00028 +20-11
		2285.41 19	65 21	2295.648	4^+	[E1]	0.000846 12	$\alpha=0.000846$ 12; $\alpha(\text{K})=1.238 \times 10^{-5}$ 17; $\alpha(\text{L})=1.101 \times 10^{-6}$ 15; $\alpha(\text{M})=1.408 \times 10^{-7}$ 20 $\alpha(\text{N})=7.67 \times 10^{-9}$ 11; $\alpha(\text{IPF})=0.000833$ 12 I_γ : unweighted average of 44 9 from (α, py) and 85 10 from (n, γ) E=thermal.
		3596.76 17	100 10	983.531	2^+	[E1]	1.52×10^{-3} 2	B(E1)(W.u.)= 1.1×10^{-4} +8-4 $\alpha(\text{K})=6.81 \times 10^{-6}$ 10; $\alpha(\text{L})=6.04 \times 10^{-7}$ 8; $\alpha(\text{M})=7.73 \times 10^{-8}$ 11 $\alpha(\text{N})=4.21 \times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001517$ 21 E_γ : from (n, γ) E=thermal. Other: 3600 8 from (n,n' γ). I_γ : from (n, γ) E=thermal. Other: 100 19 from (α, py).
4719.137	4^+	1479.339 18	100 6	3239.771	4^+	[M1,E2]	0.000117 14	B(M1)(W.u.)=0.071 +26-16 (if pure M1); B(E2)(W.u.)=81 +30-18 (if pure E2) $\alpha=0.000117$ 14; $\alpha(\text{K})=4.28 \times 10^{-5}$ 30; $\alpha(\text{L})=3.82 \times 10^{-6}$ 27; $\alpha(\text{M})=4.89 \times 10^{-7}$ 34 $\alpha(\text{N})=2.66 \times 10^{-8}$ 18; $\alpha(\text{IPF})=7.0 \times 10^{-5}$ 11 I_γ : from (α, py). Other: 100.0 58 from (n, γ) E=thermal.
		1495.53 21	45 3	3223.971	3^+	[M1,E2]	0.000121 14	B(M1)(W.u.)=0.031 +12-7 (if pure M1); B(E2)(W.u.)=34 +13-8 (if pure E2) $\alpha=0.000121$ 14; $\alpha(\text{K})=4.20 \times 10^{-5}$ 28; $\alpha(\text{L})=3.74 \times 10^{-6}$ 26; $\alpha(\text{M})=4.79 \times 10^{-7}$ 33 $\alpha(\text{N})=2.60 \times 10^{-8}$ 17; $\alpha(\text{IPF})=7.5 \times 10^{-5}$ 11 I_γ : weighted average of 43 6 from (α, py) and 45.8 26 from (n, γ) E=thermal.
4757.73	(3^-)	1140.94 10	100 12	3616.812	2^+			
4783.27	$(2^+, 3, 4^+)$	3774.8 6	20 5	983.531	2^+			
		2486.4 5	50 13	2295.648	4^+			
		3799.64 12	100 7	983.531	2^+			

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	$\alpha^\dagger$	Comments
4792.31	(1 ⁻ ,2,3 ⁻)	1092.3 3	9.5 16	3699.52	1 ⁽⁻⁾			E_γ, I_γ : from (n, γ) E=thermal only; not seen in (α ,p γ).
		1421 [#]	12.5 25	3370.87	2 ⁺			
		2371.18 8	82 6	2421.053	2 ⁺			I_γ : from (n, γ) E=thermal. Other: 137 18 from (α ,p γ) is discrepant.
		3808.58 7	100 6	983.531	2 ⁺			I_γ : from (n, γ) E=thermal. Other: 100 15 from (α ,p γ).
4794.11	(2 ⁺)	2498.44 14	100 10	2295.648	4 ⁺			
		4793.5 4	14.7 25	0.0	0 ⁺			
4795.1	(3 ⁻ ,4)	749	41 7	4046.6	5 ⁽⁻⁾			
		942	62 17	3852.24	3 ⁻			
		1012	34 7	3782.459	3 ⁻ ,4 ⁻			
		1556	100 17	3239.771	4 ⁺			
		1571	38 7	3223.971	3 ⁺			
		2500	69 14	2295.648	4 ⁺			
4861.0	2 ⁺ ,3 ⁺ ,4 ⁺	1622	100 15	3239.771	4 ⁺			
		2566	92 15	2295.648	4 ⁺			
4885.0	(2 ⁺ ,3 ⁺ ,4 ⁺)	1526	75 18	3358.823	3 ⁻			
		2464	100 18	2421.053	2 ⁺			
4910.57	(1 ⁺ ,2 ⁺)	1293.71 6	100 6	3616.812	2 ⁺			I_γ : from (n, γ) E=thermal. Other: 100 18 from (α ,p γ).
		1539.63 18	53 7	3370.87	2 ⁺			I_γ : weighted average of 70 14 from (α ,p γ) and 50 6 from (n, γ) E=thermal.
		1686.63 9	67 5	3223.971	3 ⁺			E_γ, I_γ : from (n, γ) E=thermal only; not seen in (α ,p γ).
		2489.7 4	57 11	2421.053	2 ⁺			I_γ : from (α ,p γ). Other: 60 14 from (n, γ) E=thermal.
		4911.8 8	14 4	0.0	0 ⁺			
4916.3	5 ⁻	870	56 8	4046.6	5 ⁽⁻⁾	[M1,E2]	0.000146 26	$\alpha=0.000146$ 26; $\alpha(K)=0.000133$ 23; $\alpha(L)=1.19\times 10^{-5}$ 21; $\alpha(M)=1.52\times 10^{-6}$ 27
								$\alpha(N)=8.2\times 10^{-8}$ 14
								B(M1)(W.u.)=0.049 +49-20 (if pure M1);
								B(E2)(W.u.)=1.6 $\times 10^2$ +16-6 (if pure E2)
		1133	100 14	3782.459	3 ⁻ ,4 ⁻	[M1,E2]	8.3 $\times 10^{-5}$ 9	B(M1)(W.u.)=0.040 +39-16 (if pure M1);
								B(E2)(W.u.)=8 $\times 10^1$ +8-3 (if pure E2)
								$\alpha=8.3\times 10^{-5}$ 9; $\alpha(K)=7.4\times 10^{-5}$ 8; $\alpha(L)=6.6\times 10^{-6}$ 7;
								$\alpha(M)=8.4\times 10^{-7}$ 9
								$\alpha(N)=4.6\times 10^{-8}$ 5; $\alpha(IPF)=1.9\times 10^{-6}$ 4
		1408	44 8	3508.548	6 ⁺	[E1]	0.0002227 31	B(E1)(W.u.)=0.00021 +23-9
								$\alpha=0.0002227$ 31; $\alpha(K)=2.59\times 10^{-5}$ 4; $\alpha(L)=2.308\times 10^{-6}$ 32;
								$\alpha(M)=2.95\times 10^{-7}$ 4
								$\alpha(N)=1.605\times 10^{-8}$ 22; $\alpha(IPF)=0.0001942$ 27
4924.92	(2,3,4) ⁺	544 [#]	6.8 17	4381.4	(3,4,5 ⁻)			
		851 [#]	8.5 17	4074.511	2 ⁺	[M1,E2]	0.000154 28	B(M1)(W.u.)=0.08 +7-3 (if pure M1);
								B(E2)(W.u.)=2.7 $\times 10^2$ +25-11 (if pure E2)

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)							
$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	$\alpha^\ddagger$
$\alpha=0.000154$ 28; $\alpha(\text{K})=0.000140$ 25; $\alpha(\text{L})=1.25\times 10^{-5}$ 23; $\alpha(\text{M})=1.60\times 10^{-6}$ 29 $\alpha(\text{N})=8.7\times 10^{-8}$ 16 $\text{B}(\text{M1})(\text{W.u.})=0.038$ +35-14 (if pure M1); $\text{B}(\text{E2})(\text{W.u.})=33$ +30-12 (if pure E2) $\alpha=0.000183$ 22; $\alpha(\text{K})=3.34\times 10^{-5}$ 18; $\alpha(\text{L})=2.98\times 10^{-6}$ 16; $\alpha(\text{M})=3.81\times 10^{-7}$ 21 $\alpha(\text{N})=2.08\times 10^{-8}$ 11; $\alpha(\text{IPF})=0.000147$ 20 $\text{B}(\text{M1})(\text{W.u.})=0.045$ +43-21 (if pure M1); $\text{B}(\text{E2})(\text{W.u.})=38$ +37-18 (if pure E2) $\alpha=0.000189$ 22; $\alpha(\text{K})=3.29\times 10^{-5}$ 18; $\alpha(\text{L})=2.93\times 10^{-6}$ 16; $\alpha(\text{M})=3.75\times 10^{-7}$ 20 $\alpha(\text{N})=2.04\times 10^{-8}$ 11; $\alpha(\text{IPF})=0.000153$ 20 I_γ : unweighted average of 22.0 51 from (α, py) and 55.6 56 from (n, γ) E=thermal. $\text{B}(\text{M1})(\text{W.u.})=0.031$ +28-11 (if pure M1); $\text{B}(\text{E2})(\text{W.u.})=11$ +10-4 (if pure E2) $\alpha=0.00059$ 5; $\alpha(\text{K})=1.55\times 10^{-5}$ 4; $\alpha(\text{L})=1.37\times 10^{-6}$ 4; $\alpha(\text{M})=1.76\times 10^{-7}$ 5 $\alpha(\text{N})=9.59\times 10^{-9}$ 27; $\alpha(\text{IPF})=0.00057$ 5 I_γ : from (α, py) . Other: 100 17 from (n, γ) E=thermal. I_γ : weighted average of 41 8 from (α, py) and 68 15 from (n, γ) E=thermal. E_γ, I_γ : from (n, γ) E=thermal. Other: 3963 9 from $(\text{n}, \text{n}'\gamma)$. I_γ : from (n, γ) E=thermal. Other: 100 18 from (α, py) .							
4924.92	(2,3,4) ⁺	1686 [#]	32 5	3239.771	4 ⁺	[M1,E2]	0.000183 22
		1700.89 16	39 17	3223.971	3 ⁺	[M1,E2]	0.000189 22
		2629.1 3	100 12	2295.648	4 ⁺	[M1,E2]	0.00059 5
4939.93	(2,3,4) ⁺	1157 [#]	12. 4	3782.459	3 ⁻ , 4 ⁻		
		1701 [#]	43 8	3239.771	4 ⁺		
		2644.5 4	47 11	2295.648	4 ⁺		
		3956.17 16	100 9	983.531	2 ⁺		
4956.6	(4 ⁺ , 5, 6 ⁻)	910	36 7	4046.6	5 ⁽⁻⁾		
		1173	100 16	3782.459	3 ⁻ , 4 ⁻		
		1448	45 7	3508.548	6 ⁺		
		1624	45 7	3333.187	6 ⁺		
4970.7	0 ⁺	1231	100 18	3738.60	1 ⁺		
		3988	82 18	983.531	2 ⁺		
4992.0	5 ⁻	946	100 10	4046.6	5 ⁽⁻⁾		
		1139	18 3	3852.24	3 ⁻		
		1209	21 3	3782.459	3 ⁻ , 4 ⁻		
		1484	23 5	3508.548	6 ⁺		
5145.85	4 ⁺	1073 [#]	88 25	4074.511	2 ⁺	[E2]	0.0001022 14
$\text{B}(\text{E2})(\text{W.u.})=1.9\times 10^2$ +19-8 $\alpha=0.0001022$ 14; $\alpha(\text{K})=9.28\times 10^{-5}$ 13; $\alpha(\text{L})=8.31\times 10^{-6}$ 12; $\alpha(\text{M})=1.062\times 10^{-6}$ 15 $\alpha(\text{N})=5.75\times 10^{-8}$ 8							

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	δ	$\alpha^\ddagger$	Comments
5145.85	4 ⁺	1906.08 9	52 4	3239.771	4 ⁺	[M1,E2]		0.000269 30	B(M1)(W.u.)=0.010 +9-4 (if pure M1); B(E2)(W.u.)=6.5 +64-24 (if pure E2) $\alpha=0.000269$ 30; $\alpha(K)=2.67\times10^{-5}$ 12; $\alpha(L)=2.38\times10^{-6}$ 11; $\alpha(M)=3.05\times10^{-7}$ 14 $\alpha(N)=1.66\times10^{-8}$ 7; $\alpha(\text{IPF})=0.000240$ 28 E_γ, I_γ : from (n, γ) E=thermal. Other: $I_\gamma=104$ 16 from ($\alpha, p\gamma$) is discrepant.
		1921.63 22	100 18	3223.971	3 ⁺	[M1,E2]		0.000276 30	B(M1)(W.u.)=0.018 +17-7 (if pure M1); B(E2)(W.u.)=12 +12-5 (if pure E2) $\alpha=0.000276$ 30; $\alpha(K)=2.64\times10^{-5}$ 12; $\alpha(L)=2.35\times10^{-6}$ 10; $\alpha(M)=3.00\times10^{-7}$ 13 $\alpha(N)=1.64\times10^{-8}$ 7; $\alpha(\text{IPF})=0.000247$ 29 I_γ : from (n, γ) E=thermal. Other: 100 16 from ($\alpha, p\gamma$).
		2725.7 5	22 5	2421.053	2 ⁺	[E2]		0.000678 9	B(E2)(W.u.)=0.46 +46-19 $\alpha=0.000678$ 9; $\alpha(K)=1.493\times10^{-5}$ 21; $\alpha(L)=1.328\times10^{-6}$ 19; $\alpha(M)=1.699\times10^{-7}$ 24 $\alpha(N)=9.26\times10^{-9}$ 13; $\alpha(\text{IPF})=0.000661$ 9
		2850.01 12	87 7	2295.648	4 ⁺	[M1,E2]		0.00068 5	B(M1)(W.u.)=0.0047 +45-18 (if pure M1); B(E2)(W.u.)=1.5 +14-6 (if pure E2) $\alpha=0.00068$ 5; $\alpha(K)=1.36\times10^{-5}$ 4; $\alpha(L)=1.207\times10^{-6}$ 32; $\alpha(M)=1.54\times10^{-7}$ 4 $\alpha(N)=8.42\times10^{-9}$ 22; $\alpha(\text{IPF})=0.00066$ 5 I_γ : from (n, γ) E=thermal. Other: 125 21 from ($\alpha, p\gamma$).
5155.7	5 ⁽⁺⁾	751	32 5	4404.8	5 ⁽⁺⁾	[M1]		0.0001626 23	B(M1)(W.u.)>1.5 $\alpha=0.0001626$ 23; $\alpha(K)=0.0001476$ 21; $\alpha(L)=1.321\times10^{-5}$ 18; $\alpha(M)=1.690\times10^{-6}$ 24 $\alpha(N)=9.18\times10^{-8}$ 13 Mult.: M1 from comparison with RUL for $T_{1/2}<7$ fs.
		1647	100 5	3508.548	6 ⁺	(M1(+E2))	-0.04 8	0.0001494 22	B(M1)(W.u.)>0.5 $\alpha=0.0001494$ 22; $\alpha(K)=3.30\times10^{-5}$ 5; $\alpha(L)=2.94\times10^{-6}$ 4; $\alpha(M)=3.76\times10^{-7}$ 5 $\alpha(N)=2.050\times10^{-8}$ 29; $\alpha(\text{IPF})=0.0001130$ 16 Mult., δ : D(+Q) and δ from $p\gamma(\theta)$ in ($\alpha, p\gamma$); $\Delta\pi$ =no from level scheme.
5158.0	4 ⁺	1919 [#]	70 12	3239.771	4 ⁺	[M1,E2]		0.000275 30	$\alpha=0.000275$ 30; $\alpha(K)=2.64\times10^{-5}$ 12; $\alpha(L)=2.35\times10^{-6}$ 10; $\alpha(M)=3.01\times10^{-7}$ 13 $\alpha(N)=1.64\times10^{-8}$ 7; $\alpha(\text{IPF})=0.000245$ 29
		1933.9 3	100 18	3223.971	3 ⁺	[M1,E2]		0.000281 31	$\alpha=0.000281$ 31; $\alpha(K)=2.61\times10^{-5}$ 11; $\alpha(L)=2.32\times10^{-6}$ 10; $\alpha(M)=2.97\times10^{-7}$ 13 $\alpha(N)=1.62\times10^{-8}$ 7; $\alpha(\text{IPF})=0.000252$ 29
		2863 [#]	100 18	2295.648	4 ⁺	[M1,E2]		0.00068 5	$\alpha=0.00068$ 5; $\alpha(K)=1.348\times10^{-5}$ 35; $\alpha(L)=1.199\times10^{-6}$ 32;

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_{γ}^{$\ddagger$}</u>	<u>I_{γ}^{$\ddagger$}</u>	<u>E_f</u>	<u>J_f^{π}</u>	<u>Mult.</u>	<u>δ</u>	<u>$\alpha^{\ddagger}$</u>	<u>Comments</u>
5158.0	4 ⁺	4174 [#]	33 9	983.531	2 ⁺	[E2]		1.24×10 ⁻³ 2	$\alpha(\text{M})=1.53\times 10^{-7}$ 4 $\alpha(\text{N})=8.36\times 10^{-9}$ 22; $\alpha(\text{IPF})=0.00067$ 5 B(E2)(W.u.)>0.12 $\alpha(\text{K})=7.72\times 10^{-6}$ 11; $\alpha(\text{L})=6.86\times 10^{-7}$ 10; $\alpha(\text{M})=8.78\times 10^{-8}$ 12 $\alpha(\text{N})=4.79\times 10^{-9}$ 7; $\alpha(\text{IPF})=0.001232$ 17 B(M1)(W.u.)=0.18 +13-6 (if pure M1); B(E2)(W.u.)=1.2×10 ³ +9-4 (if pure E2) $\alpha=3.7\times 10^{-4}$ 11; $\alpha(\text{K})=3.3\times 10^{-4}$ 10; $\alpha(\text{L})=3.0\times 10^{-5}$ 9; $\alpha(\text{M})=3.8\times 10^{-6}$ 12 $\alpha(\text{N})=2.1\times 10^{-7}$ 6 Mult.: pure E2 ruled out by RUL. B(M1)(W.u.)=0.051 +34-17; B(E2)(W.u.)=0.6 +17-4 $\alpha=0.0001542$ 24; $\alpha(\text{K})=3.26\times 10^{-5}$ 5; $\alpha(\text{L})=2.90\times 10^{-6}$ 4; $\alpha(\text{M})=3.71\times 10^{-7}$ 5 $\alpha(\text{N})=2.022\times 10^{-8}$ 29; $\alpha(\text{IPF})=0.0001183$ 19 Mult.: D+Q from $\text{py}(\theta)$ in (α,py); E1+M2 ruled out by RUL.
5169.8	7 ⁺	605	7.7 15	4564.8	8 ⁽⁺⁾	[M1+E2]		3.7×10 ⁻⁴ 11	B(M1)(W.u.)=0.08 +6-3; B(E2)(W.u.)=0.5 +14-4 $\alpha=0.0002139$ 31; $\alpha(\text{K})=2.73\times 10^{-5}$ 4; $\alpha(\text{L})=2.431\times 10^{-6}$ 34; $\alpha(\text{M})=3.11\times 10^{-7}$ 4 $\alpha(\text{N})=1.696\times 10^{-8}$ 24; $\alpha(\text{IPF})=0.0001839$ 27 Mult.: D+Q from $\text{py}(\theta)$ in (α,py); E1+M2 ruled out by RUL. B(M1)(W.u.)=0.95 +50-35 $\alpha=0.000232$ 23; $\alpha(\text{K})=0.000211$ 21; $\alpha(\text{L})=1.89\times 10^{-5}$ 19; $\alpha(\text{M})=2.42\times 10^{-6}$ 24 $\alpha(\text{N})=1.31\times 10^{-7}$ 13 E _{γ} : from (⁷ Li,p2n γ). I _{γ} : from (α,py). Mult.: D(+Q) from $\text{py}(\theta)$ in (α,py); $\Delta\pi$ =no from level scheme . B(E2)(W.u.)=7.3 +35-20 $\alpha=0.0002062$ 29; $\alpha(\text{K})=3.51\times 10^{-5}$ 5; $\alpha(\text{L})=3.13\times 10^{-6}$ 4; $\alpha(\text{M})=4.00\times 10^{-7}$ 6 $\alpha(\text{N})=2.176\times 10^{-8}$ 30; $\alpha(\text{IPF})=0.0001676$ 23 B(E2)(W.u.)=1.0 +6-4 $\alpha=0.000280$ 4; $\alpha(\text{K})=2.90\times 10^{-5}$ 4; $\alpha(\text{L})=2.59\times 10^{-6}$ 4; $\alpha(\text{M})=3.31\times 10^{-7}$ 5 $\alpha(\text{N})=1.801\times 10^{-8}$ 25; $\alpha(\text{IPF})=0.0002483$ 35
		1661	46 6	3508.548	6 ⁺	M1+E2	+0.11 +9-4	0.0001542 24	
		1837	100 8	3333.187	6 ⁺	M1+E2	+0.09 7	0.0002139 31	
5197.9	8 ⁺	632.7 10	100 4	4564.8	8 ⁽⁺⁾	(M1(+E2))	-0.03 +25-35	0.000232 23	
		1689	16.9 24	3508.548	6 ⁺	[E2]		0.0002062 29	
		1865	3.6 12	3333.187	6 ⁺	[E2]		0.000280 4	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
5251.8	(2 ⁺ ,3,4,5 ⁻)	1399	100 8	3852.24	3 ⁻				
		1469	13 4	3782.459	3 ⁻ ,4 ⁻				
		2957	13 4	2295.648	4 ⁺				
5273.0	(1 ⁻ ,2)	962	26 7	4311.3	1 ⁺				
		1571	20 5	3699.52	1 ⁽⁻⁾				
		1915	100 20	3358.823	3 ⁻				
		2853	72 13	2421.053	2 ⁺				
5300.9	(4 ⁺ ,5,6)	896	68 10	4404.8	5 ⁽⁺⁾				Mult.: not pure M2 or E2 from RUL.
		1792	100 15	3508.548	6 ⁺				
		1968	83 15	3333.187	6 ⁺				
5312.8	(5 ⁻)	1266	42 5	4046.6	5 ⁽⁻⁾	M1,E2		8.2×10 ⁻⁵ 9	B(M1)(W.u.)=0.040 +26-12 (if pure M1); B(E2)(W.u.)=61 +41-19 (if pure E2) $\alpha=8.2\times 10^{-5}$ 9; $\alpha(K)=5.8\times 10^{-5}$ 5; $\alpha(L)=5.2\times 10^{-6}$ 5; $\alpha(M)=6.7\times 10^{-7}$ 6 $\alpha(N)=3.63\times 10^{-8}$ 33; $\alpha(IPF)=1.81\times 10^{-5}$ 32 Mult., δ : E2 if J=7, M1+E2, $\delta=-1.25$ 25 if J=5, or M1+E2, $\delta=-1.7$ +9-12 if J=6, from $\text{py}(\theta)$ in (α,py) and comparison to RUL.
		1804	25 4	3508.548	6 ⁺	[E1]		0.000517 7	B(E1)(W.u.)=0.00019 +13-6 $\alpha=0.000517$ 7; $\alpha(K)=1.748\times 10^{-5}$ 24; $\alpha(L)=1.555\times 10^{-6}$ 22; $\alpha(M)=1.989\times 10^{-7}$ 28 $\alpha(N)=1.083\times 10^{-8}$ 15; $\alpha(IPF)=0.000498$ 7
		1980	100 7	3333.187	6 ⁺	(E1(+M2))	-0.07 +7-9	0.000640 13	B(E1)(W.u.)=0.00057 +48-21 $\alpha=0.000640$ 13; $\alpha(K)=1.53\times 10^{-5}$ 6; $\alpha(L)=1.36\times 10^{-6}$ 5; $\alpha(M)=1.74\times 10^{-7}$ 6 $\alpha(N)=9.50\times 10^{-9}$ 34; $\alpha(IPF)=0.000623$ 13 Mult., δ : D+Q, $\delta=-0.02$ +7-3 if J=7, or $\delta=-0.07$ +7-9 if J=5, or M1+E2, $\delta=+1.5$ 3 if J=6, from $\text{py}(\theta)$ in (α,py) and comparison to RUL.
5313.3	2 ⁺	2892	41 10	2421.053	2 ⁺				E_γ : other: 2890 5 from (n,n' γ). I_γ : other: I(2890 γ)/I(4332 γ)=100 28/12 6 is discrepant.
5340	1 ⁽⁻⁾	4330 5340 @ 3	100 10	983.531 0.0	2 ⁺ 0 ⁺	(E1)&		2.13×10 ⁻³ 3	E_γ : other: 4332 9 from (n,n' γ). $\alpha(K)=4.23\times 10^{-6}$ 6; $\alpha(L)=3.75\times 10^{-7}$ 5; $\alpha(M)=4.80\times 10^{-8}$ 7 $\alpha(N)=2.62\times 10^{-9}$ 4; $\alpha(IPF)=0.002121$ 30 I_γ : weighted average of 57 14 from (α,py) and 65 12 from (n, γ) E=thermal.
5356.23	(2 ⁺ ,3,4 ⁺)	1158.7 3	62 12	4196.90	(2 ⁺)				
		1504#	32 6	3852.24	3 ⁻				
		1998#	43 9	3358.823	3 ⁻				
		2118#	23 6	3239.771	4 ⁺				

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	$\alpha^\ddagger$	Comments
5356.23	(2 ⁺ ,3,4 ⁺)	3062 [#]	31 9	2295.648	4 ⁺			I _γ : from (n,γ) E=thermal. Other: 100 20 from (α,py).
		4372.56 15	100 9	983.531	2 ⁺			
5383.8	(3) ⁻	2144	79 13	3239.771	4 ⁺			
		3088	100 13	2295.648	4 ⁺			
5490.95	2 ⁺	1790.7 3	68 14	3699.52	1 ⁽⁻⁾			
		2267 [#]	64 12	3223.971	3 ⁺			
		3070.4 3	100 18	2421.053	2 ⁺			
		4508 [#]	36 10	983.531	2 ⁺			
5500.8	4 ⁺	1096	14 4	4404.8	5 ⁽⁺⁾	[M1,E2]	8.7×10 ⁻⁵ 10	B(M1)(W.u.)=0.046 +38-18 (if pure M1); B(E2)(W.u.)=1.0×10 ² +8-4 (if pure E2) α=8.7×10 ⁻⁵ 10; α(K)=7.9×10 ⁻⁵ 9; α(L)=7.1×10 ⁻⁶ 8; α(M)=9.0×10 ⁻⁷ 11 α(N)=4.9×10 ⁻⁸ 6
		1102	41 6	4398.7	6 ⁺	[E2]	9.70×10 ⁻⁵ 14	B(E2)(W.u.)=2.7×10 ² +22-9 α=9.70×10 ⁻⁵ 14; α(K)=8.72×10 ⁻⁵ 12; α(L)=7.80×10 ⁻⁶ 11; α(M)=9.97×10 ⁻⁷ 14
		1426	7.8 20	4074.511	2 ⁺	[E2]	0.0001167 16	α(N)=5.41×10 ⁻⁸ 8; α(IPF)=1.003×10 ⁻⁶ 14 B(E2)(W.u.)=14 +12-6 α=0.0001167 16; α(K)=4.93×10 ⁻⁵ 7; α(L)=4.41×10 ⁻⁶ 6; α(M)=5.63×10 ⁻⁷ 8
		1454	5.9 20	4046.6	5 ⁽⁻⁾	[E1]	0.000254 4	α(N)=3.06×10 ⁻⁸ 4; α(IPF)=6.24×10 ⁻⁵ 9 B(E1)(W.u.)=0.00019 +17-9 α=0.000254 4; α(K)=2.457×10 ⁻⁵ 34; α(L)=2.188×10 ⁻⁶ 31; α(M)=2.80×10 ⁻⁷ 4
		2168	27 8	3333.187	6 ⁺	[E2]	0.000420 6	α(N)=1.522×10 ⁻⁸ 21; α(IPF)=0.0002272 32 B(E2)(W.u.)=6.0 +50-24 α=0.000420 6; α(K)=2.206×10 ⁻⁵ 31; α(L)=1.965×10 ⁻⁶ 28; α(M)=2.513×10 ⁻⁷ 35
		3205	100 18	2295.648	4 ⁺	[M1,E2]	0.00082 6	α(N)=1.369×10 ⁻⁸ 19; α(IPF)=0.000396 6 B(M1)(W.u.)=0.013 +10-4 (if pure M1); B(E2)(W.u.)=3.2 +24-10 (if pure E2) α=0.00082 6; α(K)=1.129×10 ⁻⁵ 27; α(L)=1.004×10 ⁻⁶ 24; α(M)=1.284×10 ⁻⁷ 31 α(N)=7.01×10 ⁻⁹ 17; α(IPF)=0.00081 6
5521.7	3 ⁻	1739	100 14	3782.459	3 ⁻ ,4 ⁻			
		2163	92 25	3358.823	3 ⁻			
		4538	86 14	983.531	2 ⁺			
5526	1	5526 [@] 3		0.0	0 ⁺	D&		E _γ : from (γ,γ').
5545.9	(4 ⁺ to 8 ⁺)	2037	28 5	3508.548	6 ⁺			

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
5545.9	$(4^+ \text{ to } 8^+)$ 3^-	2213	100 5	3333.187	6^+				
5545.9		1165	100 22	4381.4	$(3,4,5^-)$				
		1693	38 9	3852.24	3^-				
		2322	47 13	3223.971	3^+				
5567.9	2^+	4562	88 19	983.531	2^+				
		1257	36 9	4311.3	1^+				
		1866	100 22	3699.52	$1^{(-)}$				
		4586	87 20	983.531	2^+				
5615.8	$(3)^-$	821 ^a	20 4	4795.1	$(3^-, 4)$				
		1833	100 16	3782.459	$3^-, 4^-$				
		2257	20 8	3358.823	3^-				
		4632	60 12	983.531	2^+				
5619.65	2^+	2381 [#]	100 24	3239.771	4^+				E_γ, I_γ : not seen in (n, γ) E =thermal. E_γ : from (n, γ) E =thermal. I_γ : from $(\alpha, p\gamma)$. Other: $I(2396\gamma)/I(3198\gamma)=100$ $8/97$ 3 from (n, γ) E =thermal is discrepant. I_γ : other: see comment for 2396 γ . Mult., δ : from $p\gamma(\theta)$ in $(\alpha, p\gamma)$.
		2395.62 11	78 14	3223.971	3^+				
5630.9	7	3198.44 20	92 19	2421.053	2^+				Mult., δ : from $p\gamma(\theta)$ in $(\alpha, p\gamma)$. $\alpha=8.84 \times 10^{-5}$ 12; $\alpha(K)=7.41 \times 10^{-5}$ 10; $\alpha(L)=6.63 \times 10^{-6}$ 9; $\alpha(M)=8.47 \times 10^{-7}$ 12 $\alpha(N)=4.60 \times 10^{-8}$ 6; $\alpha(\text{IPF})=6.80 \times 10^{-6}$ 10 $B(E2)(\text{W.u.}) \geq 7200$ exceeds RUL.
		1066	78 10	4564.8	$8^{(+)}$	D(+Q)	-0.03 5		
		2122	22 4	3508.548	6^+				
		2298	100 12	3333.187	6^+	D+Q	+0.06 4		
5640.03	1^+	1182.56 5	100 6	4457.455	3^+	[E2]		8.84×10^{-5} 12	$B(E2)(\text{W.u.}) \geq 7200$ exceeds RUL. $B(M1)(\text{W.u.}) > 0.02$ $\alpha(K)=6.42 \times 10^{-6}$ 9; $\alpha(L)=5.70 \times 10^{-7}$ 8; $\alpha(M)=7.30 \times 10^{-8}$ 10 $\alpha(N)=3.98 \times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001252$ 18 E_γ : from (n, γ) E =thermal. Other: 4655 3 from (γ, γ) .
		4655.8 6	35 8	983.531	2^+	M1 ^{&}		1.26×10^{-3} 2	
		5639.9 10	8×10^1 10	0.0	0^+	M1 ^{&}		1.52×10^{-3} 2	
5641.5	3^-	923	24 4	4719.137	4^+	[E1]		6.17×10^{-5} 9	I_γ : from 82 +103-82 in (n, γ) E =thermal. $B(E1)(\text{W.u.})=0.0032 + 25-11$ $\alpha=6.17 \times 10^{-5}$ 9; $\alpha(K)=5.61 \times 10^{-5}$ 8; $\alpha(L)=5.00 \times 10^{-6}$ 7; $\alpha(M)=6.39 \times 10^{-7}$ 9 $\alpha(N)=3.47 \times 10^{-8}$ 5
		1261	22 4	4381.4	$(3,4,5^-)$				
		1789	14 4	3852.24	3^-	[M1,E2]		0.000222 26	

E_γ, I_γ : not seen in (n, γ) E =thermal.
 E_γ : from (n, γ) E =thermal.
 I_γ : from $(\alpha, p\gamma)$. Other: $I(2396\gamma)/I(3198\gamma)=100$
 $8/97$ 3 from (n, γ) E =thermal is discrepant.
 I_γ : other: see comment for 2396 γ .
 Mult., δ : from $p\gamma(\theta)$ in $(\alpha, p\gamma)$.
 Mult., δ : from $p\gamma(\theta)$ in $(\alpha, p\gamma)$.
 $\alpha=8.84 \times 10^{-5}$ 12; $\alpha(K)=7.41 \times 10^{-5}$ 10;
 $\alpha(L)=6.63 \times 10^{-6}$ 9; $\alpha(M)=8.47 \times 10^{-7}$ 12
 $\alpha(N)=4.60 \times 10^{-8}$ 6; $\alpha(\text{IPF})=6.80 \times 10^{-6}$ 10
 $B(E2)(\text{W.u.}) \geq 7200$ exceeds RUL.
 $B(M1)(\text{W.u.}) > 0.02$
 $\alpha(K)=6.42 \times 10^{-6}$ 9; $\alpha(L)=5.70 \times 10^{-7}$ 8;
 $\alpha(M)=7.30 \times 10^{-8}$ 10
 $\alpha(N)=3.98 \times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001252$ 18
 E_γ : from (n, γ) E =thermal. Other: 4655 3 from (γ, γ) .
 I_γ : from 82 +103-82 in (n, γ) E =thermal.
 $B(E1)(\text{W.u.})=0.0032 + 25-11$
 $\alpha=6.17 \times 10^{-5}$ 9; $\alpha(K)=5.61 \times 10^{-5}$ 8;
 $\alpha(L)=5.00 \times 10^{-6}$ 7; $\alpha(M)=6.39 \times 10^{-7}$ 9
 $\alpha(N)=3.47 \times 10^{-8}$ 5

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_{γ}^{$\ddagger$}</u>	<u>I_{γ}^{$\ddagger$}</u>	<u>E_f</u>	<u>J_f^{π}</u>	<u>Mult.</u>	<u>$\alpha^{\ddagger}$</u>	<u>Comments</u>
5641.5	3 ⁻	1939	22 4	3699.52	1 ⁽⁻⁾	[E2]	0.000314 4	B(E2)(W.u.)=9 +7-4 (if pure E2) $\alpha=0.000222$ 26; $\alpha(K)=3.00\times 10^{-5}$ 15; $\alpha(L)=2.67\times 10^{-6}$ 13; $\alpha(M)=3.42\times 10^{-7}$ 17 $\alpha(N)=1.86\times 10^{-8}$ 9; $\alpha(\text{IPF})=0.000189$ 24
		2418	20 4	3223.971	3 ⁺	[E1]	0.000927 13	B(E2)(W.u.)=9 +7-3 $\alpha=0.000314$ 4; $\alpha(K)=2.70\times 10^{-5}$ 4; $\alpha(L)=2.406\times 10^{-6}$ 34; $\alpha(M)=3.08\times 10^{-7}$ 4 $\alpha(N)=1.675\times 10^{-8}$ 23; $\alpha(\text{IPF})=0.000284$ 4
		3347	100 16	2295.648	4 ⁺	[E1]	1.41 $\times 10^{-3}$ 2	B(E1)(W.u.)=0.00015 +12-5 $\alpha=0.000927$ 13; $\alpha(K)=1.145\times 10^{-5}$ 16; $\alpha(L)=1.018\times 10^{-6}$ 14; $\alpha(M)=1.301\times 10^{-7}$ 18 $\alpha(N)=7.09\times 10^{-9}$ 10; $\alpha(\text{IPF})=0.000915$ 13
5762.8	(4 ⁺ ,5,6 ⁺)	1716	15 3	4046.6	5 ⁽⁻⁾	[M1,E2]	0.000210 25	B(E1)(W.u.)=0.00028 +20-10 $\alpha(K)=7.45\times 10^{-6}$ 10; $\alpha(L)=6.62\times 10^{-7}$ 9; $\alpha(M)=8.46\times 10^{-8}$ 12 $\alpha(N)=4.61\times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001406$ 20
5805.2	3 ⁻ ,4 ⁻	2254	100 21	3508.548	6 ⁺			B(M1)(W.u.)=0.008 +10-4 (if pure M1); B(E2)(W.u.)=6 +8-3 (if pure E2) $\alpha=0.000210$ 25; $\alpha(K)=3.09\times 10^{-5}$ 16; $\alpha(L)=2.76\times 10^{-6}$ 14; $\alpha(M)=3.52\times 10^{-7}$ 18
		2430	41 9	3333.187	6 ⁺			$\alpha(N)=1.92\times 10^{-8}$ 10; $\alpha(\text{IPF})=0.000176$ 23
		2523	91 18	3239.771	4 ⁺			B(M1)(W.u.)=0.07 +7-3 (if pure M1); B(E2)(W.u.)=29 +30-11 (if pure E2) $\alpha=0.00050$ 5; $\alpha(K)=1.74\times 10^{-5}$ 5; $\alpha(L)=1.55\times 10^{-6}$ 5; $\alpha(M)=1.98\times 10^{-7}$ 6
		3467	47 12	2295.648	4 ⁺			$\alpha(N)=1.080\times 10^{-8}$ 33; $\alpha(\text{IPF})=0.00049$ 5
		1759	4.2 21	4046.6	5 ⁽⁻⁾			
5827.1	3 ⁻	2044	57 11	3782.459	3 ⁻ ,4 ⁻	[E1]	1.04 $\times 10^{-3}$ 1	$\alpha(K)=1.033\times 10^{-5}$ 14; $\alpha(L)=9.18\times 10^{-7}$ 13; $\alpha(M)=1.174\times 10^{-7}$ 16 $\alpha(N)=6.40\times 10^{-9}$ 9; $\alpha(\text{IPF})=0.001024$ 14
		2468	100 19	3358.823	3 ⁻			$\alpha(K)=6.92\times 10^{-6}$ 10; $\alpha(L)=6.14\times 10^{-7}$ 9; $\alpha(M)=7.85\times 10^{-8}$ 11 $\alpha(N)=4.28\times 10^{-9}$ 6; $\alpha(\text{IPF})=0.001497$ 21
		3406	84 14	2421.053	2 ⁺			$\alpha(K)=4.72\times 10^{-6}$ 7; $\alpha(L)=4.19\times 10^{-7}$ 6; $\alpha(M)=5.36\times 10^{-8}$ 7 $\alpha(N)=2.92\times 10^{-9}$ 4; $\alpha(\text{IPF})=0.001978$ 28
		4844	30 8	983.531	2 ⁺			
5846.5	3 ⁻	2607	53 9	3239.771	4 ⁺	[E1]	1.50 $\times 10^{-3}$ 2	
		3551	100 12	2295.648	4 ⁺	[E1]	1.98 $\times 10^{-3}$ 3	
		4862	19 5	983.531	2 ⁺	[E1]		
5886.7	(4 ⁺ to 8 ⁺)	1488	37 10	4398.7	6 ⁺			
		2378	100 10	3508.548	6 ⁺			

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)									
$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	δ	$\alpha^\dagger$	Comments
5888.41	(1,2,3)	2085.67 16 2517.62 24 3467.36 21 4904.42 17	100 18 48 8 96 14 34 3	3802.73 3370.87 2421.053 983.531	2 ⁻ 2 ⁺ 2 ⁺ 2 ⁺				
5892.1	(1 ⁻ ,2 ⁺)	2533 3471 4908 5892	39 9 79 18 85 21 100 24	3358.823 2421.053 983.531 0.0	3 ⁻ 2 ⁺ 2 ⁺ 0 ⁺				
5917.8	2 ⁺	4934	100	983.531	2 ⁺				
5974.8	(4 ⁺ ,5,6)	662 1018 1570 2466 2642	65 12 88 15 100 19 85 15 46 12	5312.8 4956.6 4404.8 3508.548 3333.187	(5 ⁻) (4 ⁺ ,5,6 ⁻) 5 ⁽⁺⁾ 6 ⁺ 6 ⁺				
5990.8	(4 ⁺ ,5,6 ⁺)	1586 1592 2751	100 22 76 19 95 16	4404.8 4398.7 3239.771	5 ⁽⁺⁾ 6 ⁺ 4 ⁺				
5993.6	(2) ⁺	3572 3698 5010	100 14 33 7 42 11	2421.053 2295.648 983.531	2 ⁺ 4 ⁺ 2 ⁺				
6034.9	9 ⁺ ,7 ⁺	837	54 8	5197.9	8 ⁺	M1(+E2)		0.000160 30	$\alpha=0.000160$ 30; $\alpha(\text{K})=0.000146$ 27; $\alpha(\text{L})=1.30\times 10^{-5}$ 25; $\alpha(\text{M})=1.67\times 10^{-6}$ 31 $\alpha(\text{N})=9.0\times 10^{-8}$ 17 Mult.: D(+Q) from $\text{py}(\theta)$ in (α,py) ; E1(+M2) ruled out by RUL. δ : $\delta(9\rightarrow 8)=0.00$ 5 or $\delta(7\rightarrow 8)=-0.09$ 9 from $\text{py}(\theta)$ in (α,py) .
		1470	100 8	4564.8	8 ⁽⁺⁾	M1+E2		0.000115 14	$\alpha=0.000115$ 14; $\alpha(\text{K})=4.34\times 10^{-5}$ 30; $\alpha(\text{L})=3.87\times 10^{-6}$ 27; $\alpha(\text{M})=4.95\times 10^{-7}$ 35 $\alpha(\text{N})=2.69\times 10^{-8}$ 19; $\alpha(\text{IPF})=6.7\times 10^{-5}$ 10 Mult.: D+Q from $\text{py}(\theta)$ in (α,py) ; E1+M2 ruled out by RUL. δ : $\delta(9\rightarrow 8)=0.10$ 5 or $\delta(7\rightarrow 8)=-0.14$ 8 from $\text{py}(\theta)$ in (α,py) .
6036.8	4 ⁺	3741	100	2295.648	4 ⁺				
6039.7	6	870 1641 2531	16 4 100 6 8.8 25	5169.8 4398.7 3508.548	7 ⁺ 6 ⁺ 6 ⁺	D(+Q)	0.0 +2-3		Mult., δ : from $\text{py}(\theta)$ in (α,py) .
6040.4	(1,2)	6040	100	0.0	0 ⁺				
6042.40	(2,3)	1183 [#] 1967.78 23 5058.58 13	32 7 100 7 53 4	4861.0 4074.511 983.531	2 ⁺ ,3 ⁺ ,4 ⁺ 2 ⁺ 2 ⁺				I_γ : from (α,py) . Other: 100 18 from (n, γ) E=thermal.
6050.5		2268	100	3782.459	3 ⁻ ,4 ⁻				

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ ‡	I_γ ‡	E_f	J_f^π	Mult.	$\alpha^\dagger$	Comments
6054.47	(0 ⁺ to 4 ⁺)	3633.38 25 5070.2 5	100 13 53 8	2421.053 983.531	2 ⁺ 2 ⁺			
6084.3	(4 ⁺ ,5,6 ⁻)	1680 2301 2576	100 11 21 5 40 8	4404.8 3782.459 3508.548	5 ⁽⁺⁾ 3 ⁻ ,4 ⁻ 6 ⁺			
6086	1	6086 @ 4		0.0	0 ⁺	D&		
6103.2	10 ⁽⁺⁾ ,8	1538.8 10	100	4564.8	8 ⁽⁺⁾			E_γ : from (⁷ Li,p2n γ). Other: 1538 from (α ,p γ). Mult., δ : Q if J=10 or D+Q, -0.78 7, if J=8 from p γ (θ) in (α ,p γ).
6119.6	(4 ⁺ ,5)	2336 2611 2787 3824	30 5 29 5 20 4 100 11	3782.459 3508.548 3333.187 2295.648	3 ⁻ ,4 ⁻ 6 ⁺ 6 ⁺ 4 ⁺			
6126	1	6126 @ 3	100	0.0	0 ⁺	D&		
6138	1 ⁽⁺⁾	6138 @ 4		0.0	0 ⁺	(M1)&		
6147.8	(4 ⁺ to 8 ⁺)	1749	100	4398.7	6 ⁺			
6153.8	(4 ⁺ to 7 ⁻)	2107 2645 2821	28 10 45 9 100 16	4046.6 3508.548 3333.187	5 ⁽⁻⁾ 6 ⁺ 6 ⁺			
6172.9	8 ⁺ ,6 ⁺	975 1003	10 3 37 5	5197.9 5169.8	8 ⁺ 7 ⁺	M1+E2	0.000106 15	B(M1)(W.u.)=0.16 +18-8 (if pure M1); B(E2)(W.u.)=3.9×10 ² +42-19 (if pure E2) α =0.000106 15; α (K)=9.6×10 ⁻⁵ 13; α (L)=8.6×10 ⁻⁶ 12; α (M)=1.10×10 ⁻⁶ 15 α (N)=6.0×10 ⁻⁸ 8 Mult.: D+Q from p γ (θ) in (α ,p γ); E1+M2 ruled out by RUL. δ : $\delta(8\rightarrow7)$ =+0.07 +7-5 or $\delta(6\rightarrow7)$ =-0.10 5 from p γ (θ) in (α ,p γ). Mult., δ : D+Q, 0.00 +4-6 if J=8 or E2 if J=6 from p γ (θ) in (α ,p γ).
6176.4	(2 ⁺ ,3,4,5 ⁻)	1608 2817 3881	100 7 100 40 100 40	4564.8 3358.823 2295.648	8 ⁽⁺⁾ 3 ⁻ 4 ⁺			
6183.8	(2 ⁺ to 6 ⁺)	2944 3888	82 27 100 27	3239.771 2295.648	4 ⁺ 4 ⁺			
6223.8	(0 ⁺ to 4 ⁺)	5240	100	983.531	2 ⁺			
6233.6	3 ⁻	2616 3813 5250	88 18 63 15 100 25	3616.812 2421.053 983.531	2 ⁺ 2 ⁺ 2 ⁺			
6236	2 ⁺	6236 @ 3		0.0	0 ⁺	Q&		
6241.0	(4 ⁺ ,5 ⁻)	2907.7 4	100	3333.187	6 ⁺			
6243.8	(0 ⁺ to 3 ⁺)	2505 2873	67 13 100 13	3738.60 3370.87	1 ⁺ 2 ⁺			
6253.7	3 ⁻	1873 2180 2881	78 15 100 22 66 15	4381.4 4074.511 3370.87	(3,4,5 ⁻) 2 ⁺ 2 ⁺			

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ ‡	I_γ ‡	E_f	J_f^π
6267.8	(3 ⁻)	5284	100	983.531	2 ⁺
6313.7	(4 ⁺ ,5 ⁻)	2980.4 3	100	3333.187	6 ⁺
6315.4	(2 ⁺ ,3,4 ⁺)	2698	25 6	3616.812	2 ⁺
		2943	94 16	3370.87	2 ⁺
		4021	94 16	2295.648	4 ⁺
		5332	100 22	983.531	2 ⁺
6322.0	(2,3,4)	2963	100 16	3358.823	3 ⁻
		3098	100 16	3223.971	3 ⁺
6331.1	(1 ⁺ to 5 ⁺)	3107	100	3223.971	3 ⁺
6336.5	3 ⁻	2554	100	3782.459	3 ⁻ ,4 ⁻
6363.8	(3,4) ⁺	1959	100 17	4404.8	5 ⁽⁺⁾
		3124	89 17	3239.771	4 ⁺
6365.16	3 ⁻	1572.41 17	25 3	4792.31	(1 ⁻ ,2,3 ⁻)
		4069.47 10	100 7	2295.648	4 ⁺
6394.8	(6 ⁺ ,7 ⁻)	764	17 3	5630.9	7
		1082	14 3	5312.8	(5 ⁻)
		1197	11 3	5197.9	8 ⁺
		1438	100 9	4956.6	(4 ⁺ ,5,6 ⁻)
6400.9	(4 ⁺ to 8 ⁺)	2002	100 20	4398.7	6 ⁺
		2892	44 13	3508.548	6 ⁺
		3068	56 5	3333.187	6 ⁺
6406.0	(1 ⁻ to 5 ⁻)	2553.7 3	100	3852.24	3 ⁻
6414.8	(2 ⁺ to 6 ⁺)	4119	100	2295.648	4 ⁺
6434.6	(3 ⁻ to 7 ⁻)	2388	100	4046.6	5 ⁽⁻⁾
6451.1	(2 ⁺ ,3,4)	2598	61 13	3852.24	3 ⁻
		3212	100 22	3239.771	4 ⁺
		3227	57 13	3223.971	3 ⁺
6461.3	(4 ⁺ to 8 ⁺)	3128	100	3333.187	6 ⁺
6475.3	3 ⁻	2623	100	3852.24	3 ⁻
6490.36	(2 ⁺ ,3)	2687.52 11	100 8	3802.73	2 ⁻
		3252.4 8	16 6	3239.771	4 ⁺
		5506.4 7	33 10	983.531	2 ⁺
6491.6	(0 ⁺ to 4 ⁺)	4070	100 33	2421.053	2 ⁺
		5508	67 33	983.531	2 ⁺
6493.5	(4 ⁺ ,5,6,7 ⁻)	1577	43 9	4916.3	5 ⁻
		2447	100 14	4046.6	5 ⁽⁻⁾
		2985	29 5	3508.548	6 ⁺
6507.8	(6 ⁺ ,7 ⁻)	1551	82 29	4956.6	(4 ⁺ ,5,6 ⁻)
		1943	25 7	4564.8	8 ⁽⁺⁾
		2461	79 14	4046.6	5 ⁽⁻⁾
		2999	100 18	3508.548	6 ⁺
		3175	71 14	3333.187	6 ⁺
6518.5	4 ⁺	3279	100 16	3239.771	4 ⁺

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	$\alpha^\dagger$	Comments
6518.5	4 ⁺	3294	75 16	3223.971	3 ⁺			
6524.6	(4 ⁺ to 8 ⁺)	3016	100	3508.548	6 ⁺			
6529.5	(1 ⁻ to 6 ⁻)	2747	100	3782.459	3 ⁻ ,4 ⁻			
6537.0	(4 ⁺ to 7 ⁻)	2490	59 10	4046.6	5 ⁽⁻⁾			
		3204	100 10	3333.187	6 ⁺			
6538.9		1614	100	4924.92	(2,3,4) ⁺			
6542.0	(0 ⁺ to 4 ⁺)	5558.1 3	100	983.531	2 ⁺			
6544.8	(2 ⁺ to 6 ⁺)	4249	100	2295.648	4 ⁺			
6573.9	(5,6,7 ⁺)	943	52 15	5630.9	7			
		2169	30 12	4404.8	5 ⁽⁺⁾			
		2175	67 18	4398.7	6 ⁺			
		3065	100 18	3508.548	6 ⁺			
		3241	55 12	3333.187	6 ⁺			
6584.4	(3 ⁻)	4289	79 14	2295.648	4 ⁺			
		5600	100 14	983.531	2 ⁺			
6604.3	1 ⁻	5620 @ 4	33 @	983.531	2 ⁺	E1&	2.20×10 ⁻³ 3	B(E1)(W.u.)=0.00135 $\alpha(\text{K})=3.98\times 10^{-6}$ 6; $\alpha(\text{L})=3.53\times 10^{-7}$ 5; $\alpha(\text{M})=4.52\times 10^{-8}$ 6 $\alpha(\text{N})=2.467\times 10^{-9}$ 35; $\alpha(\text{IPF})=0.002196$ 31 B(E1)(W.u.)=0.00251
		6604 @ 3	100 @	0.0	0 ⁺	E1&		
6617.7	(4 ⁺ to 8 ⁺)	3109	100	3508.548	6 ⁺			
6627.6	(0 ⁻ ,1,2,3)	2888.9 4	100	3738.60	1 ⁺			
6634.3	(3 ⁻ ,4,5 ⁻)	2588	89 16	4046.6	5 ⁽⁻⁾			
		2781	100 21	3852.24	3 ⁻			
		3395	74 13	3239.771	4 ⁺			
6652.6	(1 ⁻ to 6 ⁻)	2870	100	3782.459	3 ⁻ ,4 ⁻			
6661.6	(3 ⁻ to 7 ⁻)	2615	100	4046.6	5 ⁽⁻⁾			
6672.6	(2,3,4) ⁺	2890	100	3782.459	3 ⁻ ,4 ⁻			
6707.29	(2 ⁺ ,3,4)	3483.5 3	100 14	3223.971	3 ⁺			
		4411.1 3	99 12	2295.648	4 ⁺			
6707.4	(2 ⁺ ,3,4 ⁺)	2854	100 15	3852.24	3 ⁻			
		4412	42 10	2295.648	4 ⁺			
		5724	50 12	983.531	2 ⁺			
6711.6	(4 ⁺ ,5,6,7 ⁻)	672	75 17	6039.7	6			
		1795	100 22	4916.3	5 ⁻			
		2665	39 11	4046.6	5 ⁽⁻⁾			
		3203	64 14	3508.548	6 ⁺			
6744.9	(4 ⁺ ,5,6 ⁺)	2698	49 9	4046.6	5 ⁽⁻⁾			
		3236	40 9	3508.548	6 ⁺			
		3412	100 20	3333.187	6 ⁺			
		4449	97 17	2295.648	4 ⁺			
6757.9	(6 ⁺ ,7,8,9)	723	29 6	6034.9	9 ⁺ ,7 ⁺			
		1127	14 4	5630.9	7			

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	Comments
6757.9	(6 ⁺ ,7,8,9)	1560	100 7	5197.9	8 ⁺		
6771.3	(4 ⁺ to 8 ⁺)	3438	100	3333.187	6 ⁺		
6798.0	(1 ⁺ ,2,3,4)	3573.9 6	100	3223.971	3 ⁺		
6808.5		2427	100	4381.4	(3,4,5 ⁻)		
6814.9	(3 ⁻)	3575	100	3239.771	4 ⁺		
6825.7	(4 ⁺ to 8 ⁺)	2427	100 17	4398.7	6 ⁺		
		3317	67 17	3508.548	6 ⁺		
6827.8	(2 ⁺ ,3,4 ⁺)	2108.7 3	100 22	4719.137	4 ⁺		
		5843.7 5	20 4	983.531	2 ⁺		
6831.6	(0 ⁺ to 4 ⁺)	4410	100 17	2421.053	2 ⁺		
		5848	67 17	983.531	2 ⁺		
6841.9	3 ⁻	3602	67 12	3239.771	4 ⁺		
		4546	100 12	2295.648	4 ⁺		
6869.0	(1 ⁻ to 5 ⁻)	3510	100	3358.823	3 ⁻		
6878.3	(0 ⁺ to 4 ⁺)	4457	100	2421.053	2 ⁺		
6880.9	(6 ⁺ ,7 ⁻)	1568	100 3	5312.8	(5 ⁻)		
		2316	11 3	4564.8	8 ⁽⁺⁾		
6886.0	(4 ⁺ to 8 ⁺)	3377	100 18	3508.548	6 ⁺		
		3553	82 18	3333.187	6 ⁺		
6898.0	(1,2 ⁺)	3901.4 7	100 29	2997.31	0 ⁺		
		5912.3 10	73 23	983.531	2 ⁺		
6907.0	10,8,6	872	100	6034.9	9 ⁺ ,7 ⁺	D+Q	Mult., δ : $\delta(10\rightarrow9)=-0.03$ 4, $\delta(8\rightarrow9)=-0.02$ 4, $\delta(8\rightarrow7)=-0.05+5-2$, or $\delta(6\rightarrow7)=-0.19$ +13-3 from $\text{py}(\theta)$ in (α,py) .
6916.7	(3 ⁻ to 7 ⁻)	2870	100	4046.6	5 ⁽⁻⁾		
6944.7	(4 ⁺ ,5,6,7 ⁻)	2898	100 14	4046.6	5 ⁽⁻⁾		
		3436	43 14	3508.548	6 ⁺		
6955.8	(5 ⁺ to 8 ⁺)	1786	43 7	5169.8	7 ⁺		
		3447	100 7	3508.548	6 ⁺		
6957.0	(1 ⁻ ,2,3,4 ⁺)	3104.4 4	100 24	3852.24	3 ⁻		
		4536.0 4	51 11	2421.053	2 ⁺		
6966.9	(2 ⁺ to 6 ⁺)	4671	100	2295.648	4 ⁺		
6971.9	(0 ⁺ to 4 ⁺)	5988	100	983.531	2 ⁺		
6975.4	(3 ⁻ to 7 ⁻)	1983	52 9	4992.0	5 ⁻		
		2019	100 9	4956.6	(4 ⁺ ,5,6 ⁻)		
6976.30	(1,2,3,4 ⁺)	1620.05 18	86 10	5356.23	(2 ⁺ ,3,4 ⁺)		
		2941.0 4	100 26	4035.153	2 ⁺		
6979	1 ⁻	6978 @ 3		0.0	0 ⁺	E1 &	
6983.4	(1 ⁻ to 5 ⁻)	3131	100	3852.24	3 ⁻		
6985.8	(6 ⁺ ,7)	1816	41 9	5169.8	7 ⁺		
		2029	94 19	4956.6	(4 ⁺ ,5,6 ⁻)		
		2421	78 16	4564.8	8 ⁽⁺⁾		
		3477	100 22	3508.548	6 ⁺		
7033.5	(4 ⁺)	2652	100	4381.4	(3,4,5 ⁻)		

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

<u>E_i(level)</u>	<u>J^{π}_i</u>	<u>E_{γ}^{$\ddagger$}</u>	<u>I_{γ}^{$\ddagger$}</u>	<u>E_f</u>	<u>J^{π}_f</u>	<u>Mult.</u>
7040.9	(6 ⁺ ,7,8,9 ⁺)	467	11.1 22	6573.9	(5,6,7 ⁺)	
		2476	100 11	4564.8	8 ⁽⁺⁾	
7041	1,2	7040 @ 4		0.0	0 ⁺	D,Q&
7054.0	(3 ⁻)	3695	100	3358.823	3 ⁻	
7060.80	(0 ⁻ ,1,2,3 ⁻)	3361.16 20	100	3699.52	1 ⁽⁻⁾	
7067.0	(3 ⁻ ,4 ⁺)	2870	100	4196.90	(2 ⁺)	
7071?	1 ⁺	7070 @ a 4		0.0	0 ⁺	M1&
7076.0	(6 ⁺ to 10 ⁺)	973	100 25	6103.2	10 ⁽⁺⁾ ,8	
		1878	75 15	5197.9	8 ⁺	
		2511	75 15	4564.8	8 ⁽⁺⁾	
7094.1	(5 ⁺ to 8 ⁺)	1924	25 13	5169.8	7 ⁺	
		3761	100 13	3333.187	6 ⁺	
7100.9	(2 ⁺ to 6 ⁺)	4805	100	2295.648	4 ⁺	
7110	1	7109 @ 5		0.0	0 ⁺	D&
7111.9	(5 to 9)	1481	100	5630.9	7	
7118.9	(6 ⁺ ,7 ⁻)	1806	100 23	5312.8	(5 ⁻)	
		1921	64 9	5197.9	8 ⁺	
		2554	64 9	4564.8	8 ⁽⁺⁾	
		2720	82 14	4398.7	6 ⁺	
		3610	45 9	3508.548	6 ⁺	
		3786	100 18	3333.187	6 ⁺	
7124	1 ⁻	7123 @ 3		0.0	0 ⁺	E1&
7149.8	(4 ⁺ to 8 ⁺)	2751	100	4398.7	6 ⁺	
7162.7	(4 ⁺ to 8 ⁺)	3654	100	3508.548	6 ⁺	
7183.6	(0 ⁺ to 4 ⁺)	4762	67 17	2421.053	2 ⁺	
		6200	100 17	983.531	2 ⁺	
7199.3	(0 ⁺ to 4 ⁺)	4778	100	2421.053	2 ⁺	
7221.6	(1,2,3,4 ⁺)	2840	100 12	4381.4	(3,4,5 ⁻)	
		3147	67 12	4074.511	2 ⁺	
7221.6	1 ⁺	7221 @ 2		0.0	0 ⁺	M1&
7256.8	(4 ⁺)	3210	100 15	4046.6	5 ⁽⁻⁾	
		4017	67 15	3239.771	4 ⁺	
7275.1	(4 ⁺)	1962	51 10	5313.3	2 ⁺	
		3766	100 16	3508.548	6 ⁺	
		3942	45 10	3333.187	6 ⁺	
7290.0	3 ⁺	6306	100	983.531	2 ⁺	
7323.0	3 ⁻	6339	100	983.531	2 ⁺	
7326.9	(6 ⁺ to 10 ⁺)	2129	100 11	5197.9	8 ⁺	
		2762	54 11	4564.8	8 ⁽⁺⁾	
7344.8	(4 ⁺ to 8 ⁺)	2946	100	4398.7	6 ⁺	
7353.9	(5 to 9)	1723	100	5630.9	7	
7358.98	2 ⁺	3620.3 3	84 11	3738.60	1 ⁺	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\ddagger}$	$I_\gamma^{\ddagger}$	E_f	J_f^π	Mult.	Comments
7358.98	2 ⁺	4134.85 23 4937.6 4 6374.7 5	100 14 73 14 51 8	3223.971 2421.053 983.531	3 ⁺ 2 ⁺ 2 ⁺		
7375.1	11,9,7	468 1272	11.1 22 100.0 22	6907.0 6103.2	10,8,6 10 ⁽⁺⁾ ,8	D+Q	Mult.: not pure E2 or M2 ($\Delta J=2$) from comparison to RUL. Mult., δ : $\delta(11 \rightarrow 10)=0.00$ 6, $\delta(9 \rightarrow 10)=-0.05$ 7, $\delta(9 \rightarrow 8)=0.00$ 7, or $\delta(7 \rightarrow 8)=-0.07$ 9 from $\text{py}(\theta)$ in (α, py) .
7387.9		814	100	6573.9	(5,6,7 ⁺)		
7427.9	9,7	1393 2230 2863	100 9 21 5 30 8	6034.9 5197.9 4564.8	9 ⁺ ,7 ⁺ 8 ⁺ 8 ⁽⁺⁾		Mult., δ : D+Q, -0.60 15, if $9 \rightarrow 9$, Q if $9 \rightarrow 7$, or D+Q, -0.67 15, if $7 \rightarrow 7$.
7431.9	(2,3,4) ⁺	5136	100	2295.648	4 ⁺		
7442.9	(4 ⁺ ,5,6 ⁺)	3044 5147	54 12 100 12	4398.7 2295.648	6 ⁺ 4 ⁺		
7450	1 ⁻	7449 @ 3		0.0	0 ⁺	E1 &	
7476.8	(3 ⁺ to 7 ⁺)	2520 3072	100 12 47 12	4956.6 4404.8	(4 ⁺ ,5,6 ⁻) 5 ⁽⁺⁾		
7484.0	(0 ⁺ to 4 ⁺)	6500	100	983.531	2 ⁺		
7484	1	7483 @ 4		0.0	0 ⁺	D &	
7497.9	(4 ⁺)	2185	100	5312.8	(5 ⁻)		
7531.9	(6 ⁺ ,7,8 ⁺)	1901 2334 3133	43 7 100 16 84 14	5630.9 5197.9 4398.7	7 8 ⁺ 6 ⁺		
7536.0		460 629 778	29 14 86 14 71 14	7076.0 6907.0 6757.9	(6 ⁺ to 10 ⁺) 10,8,6 (6 ⁺ ,7,8,9)		
7541.71	(2 ⁺ ,3,4 ⁺)	1433 3344.66 9 4184.5 15 4302.6 4 4316.8 5	100 14 100 7 3.7 22 13.8 27 12.4 27	6103.2 4196.90 3358.823 3239.771 3223.971	10 ⁽⁺⁾ ,8 (2 ⁺) 3 ⁻ 4 ⁺ 3 ⁺		
7557.0	(2 ⁺ to 6 ⁺)	5261	100	2295.648	4 ⁺		
7572.4	(4 ⁺ to 8 ⁺)	4239	100	3333.187	6 ⁺		
7574.15	(2 ⁺ ,3,4,5 ⁻)	3186.35 22	100	4387.691	4 ⁺		
7586	1 ⁽⁻⁾	7585 @ 4		0.0	0 ⁺	(E1) &	
7588.1	(5,6,7,8 ⁺)	1415 1957 4255	50 10 88 14 100 19	6172.9 5630.9 3333.187	8 ⁺ ,6 ⁺ 7 6 ⁺		
7616.13	(1 ⁻ ,2)	2858.8 3 3763.7 3 3876.8 3	100 16 55 10 100 16	4757.73 3852.24 3738.60	(3 ⁻) 3 ⁻ 1 ⁺		
7623.9	(6 ⁺ ,7 ⁻)	3916.8 6 2311	42 10 100 20	3699.52 5312.8	1 ⁽⁻⁾ (5 ⁻)		

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Ti})$ (continued)							
$E_i(\text{level})$	J_i^π	$E_\gamma^\ddagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.	Comments
7623.9	(6 ⁺ , 7 ⁻)	3059	100 20	4564.8	8 ⁽⁺⁾		
7656.9	(6 ⁺ to 10 ⁺)	3092	100	4564.8	8 ⁽⁺⁾		
7669.2	10, 8	1566	100	6103.2	10 ⁽⁺⁾ , 8	D+Q	Mult., δ : $\delta(10 \rightarrow 10) = -0.90$ 14 or $\delta(8 \rightarrow 8) = -0.95$ 15 from $p\gamma(\theta)$ in $(\alpha, p\gamma)$.
7709.7	(3 ⁻ to 7 ⁻)	3663	100	4046.6	5 ⁽⁻⁾		
7969	1	7968 @ 4		0.0	0 ⁺	D&	
8010	1	8009 @ 4		0.0	0 ⁺	D&	
8092.1	12, 10, 8, 6	717	100	7375.1	11, 9, 7	D+Q	δ , Mult.: $\delta(12 \rightarrow 11) = +0.02$ 6, $\delta(10 \rightarrow 11) = -0.05$ 6, $\delta(10 \rightarrow 9) = +0.02$ 6, $\delta(8 \rightarrow 9) = -0.05$ 6, $\delta(8 \rightarrow 7) = +0.02$ 6, or $\delta(6 \rightarrow 7) = -0.07$ 6 from $p\gamma(\theta)$ in $(\alpha, p\gamma)$.
8199	1 ⁺	8198 @ 4		0.0	0 ⁺	(M1)	Mult.: D, Q from $\gamma(\theta)$ and azimuthal asymmetries in (γ, γ) ; $\Delta\pi$ =no from level scheme.
8255	1	8254 @ 4		0.0	0 ⁺	D&	
8323.9	10, 8, 6	896	100	7427.9	9, 7	D+Q	Mult., δ : $\delta(10 \rightarrow 9) = +0.05$ 7, $\delta(8 \rightarrow 9) = -0.14$ 8, $\delta(8 \rightarrow 7) = +0.10$ +10-5, $\delta(6 \rightarrow 7) = -0.19$ +13-3.
8572	1 ⁽⁻⁾	8571 @ 4		0.0	0 ⁺	(E1)&	
8592	1	8591 @ 4		0.0	0 ⁺	D&	
8672	1	8671 @ 5		0.0	0 ⁺	D&	
8933	1	8932 @ 5		0.0	0 ⁺	D&	
8996	1 ⁽⁺⁾	8995 @ 5		0.0	0 ⁺	(M1)&	
9025	1	9024 @ 5		0.0	0 ⁺	D&	
9977	1 ⁻	9976 @ 6		0.0	0 ⁺	E1&	

[†] Additional information 1.

[‡] From $(\alpha, p\gamma)$ for those with no ΔE_γ and from (n, γ) E=thermal for those with ΔE_γ , unless otherwise noted. For E_γ from $(\alpha, p\gamma)$, $\Delta E_\gamma = 1$ keV is assumed in the least-squares fit to get $E(\text{level})$.

Those γ branches are reported by 1979G107 in $(\alpha, p\gamma)$, but not confirmed in (n, γ) E=thermal by 1984Ru06, which constructs the (n, γ) level scheme with the aid of the Ritz combination and previous experiments. This method in 1984Ru06 is, perhaps, more rigorous than those employed by other authors for the placement of transitions. Therefore, if for states observed in (n, γ) there are transitions assigned in other experiments which are not confirmed, the placements of these transitions are probably questionable.

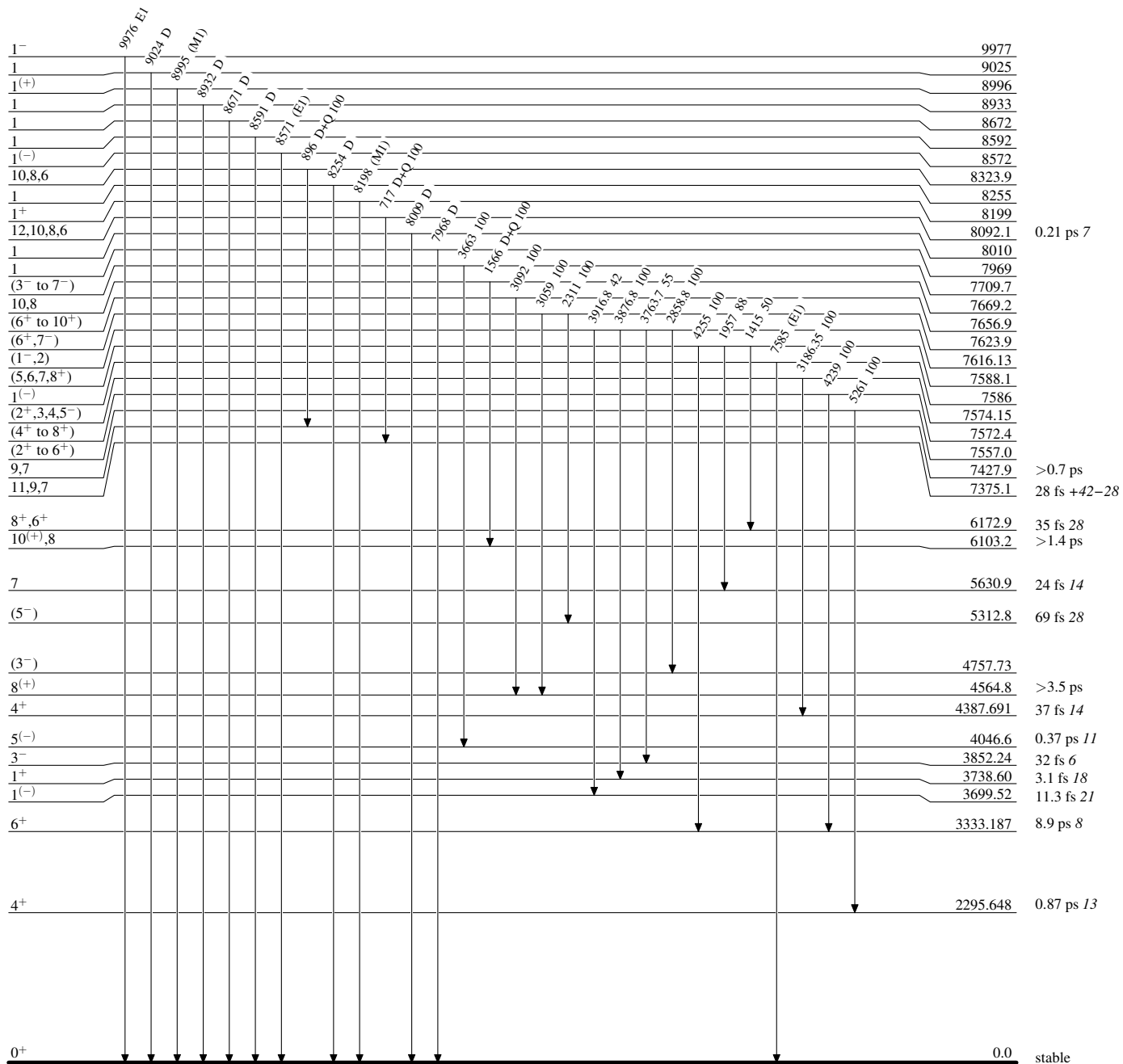
@ From (γ, γ') .

& From $\gamma(\theta)$ and azimuthal asymmetries in (γ, γ') .

^a Placement of transition in the level scheme is uncertain.

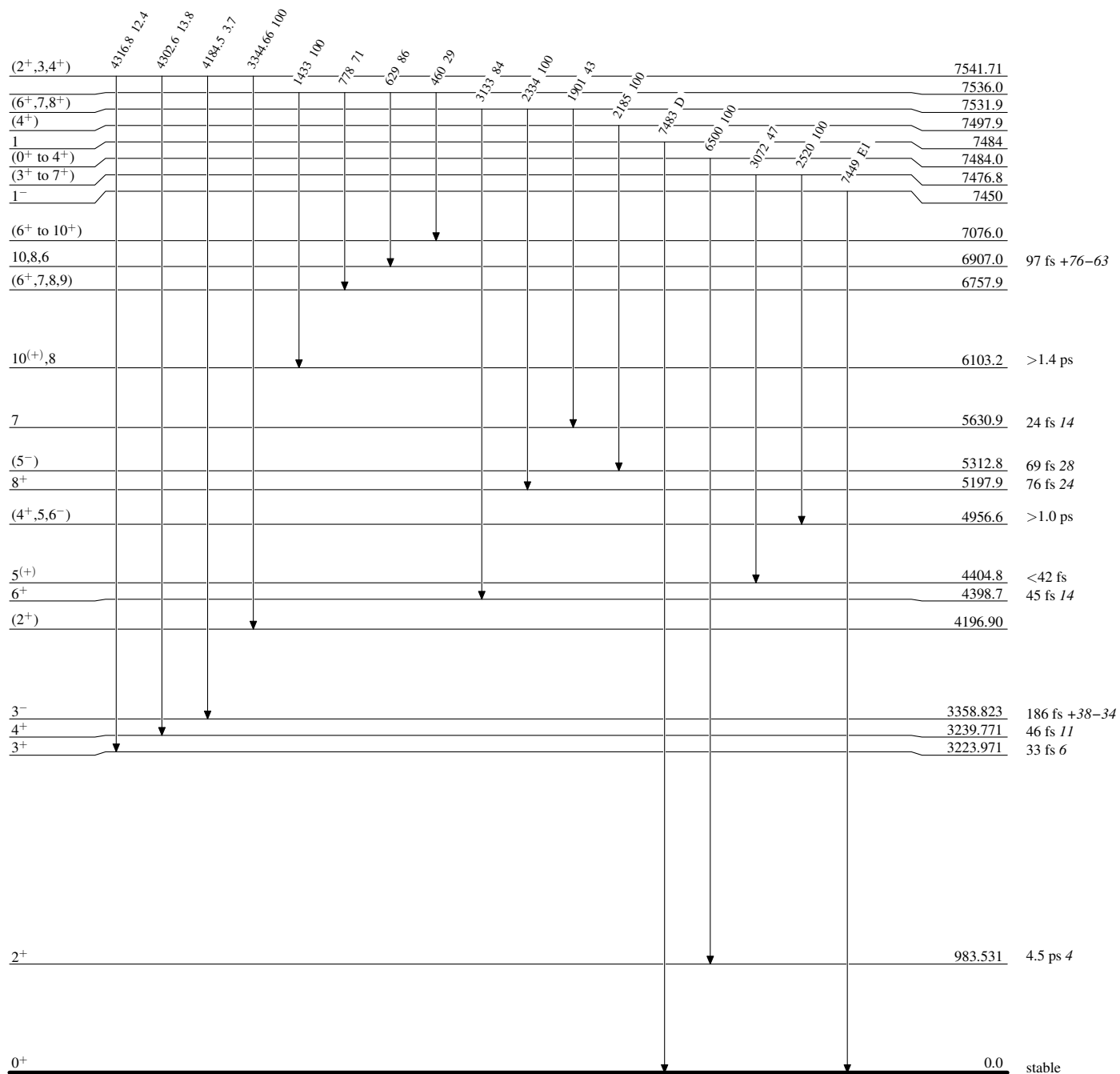
Adopted Levels, Gammas**Level Scheme**

Intensities: Relative photon branching from each level



Adopted Levels, Gammas**Level Scheme (continued)**

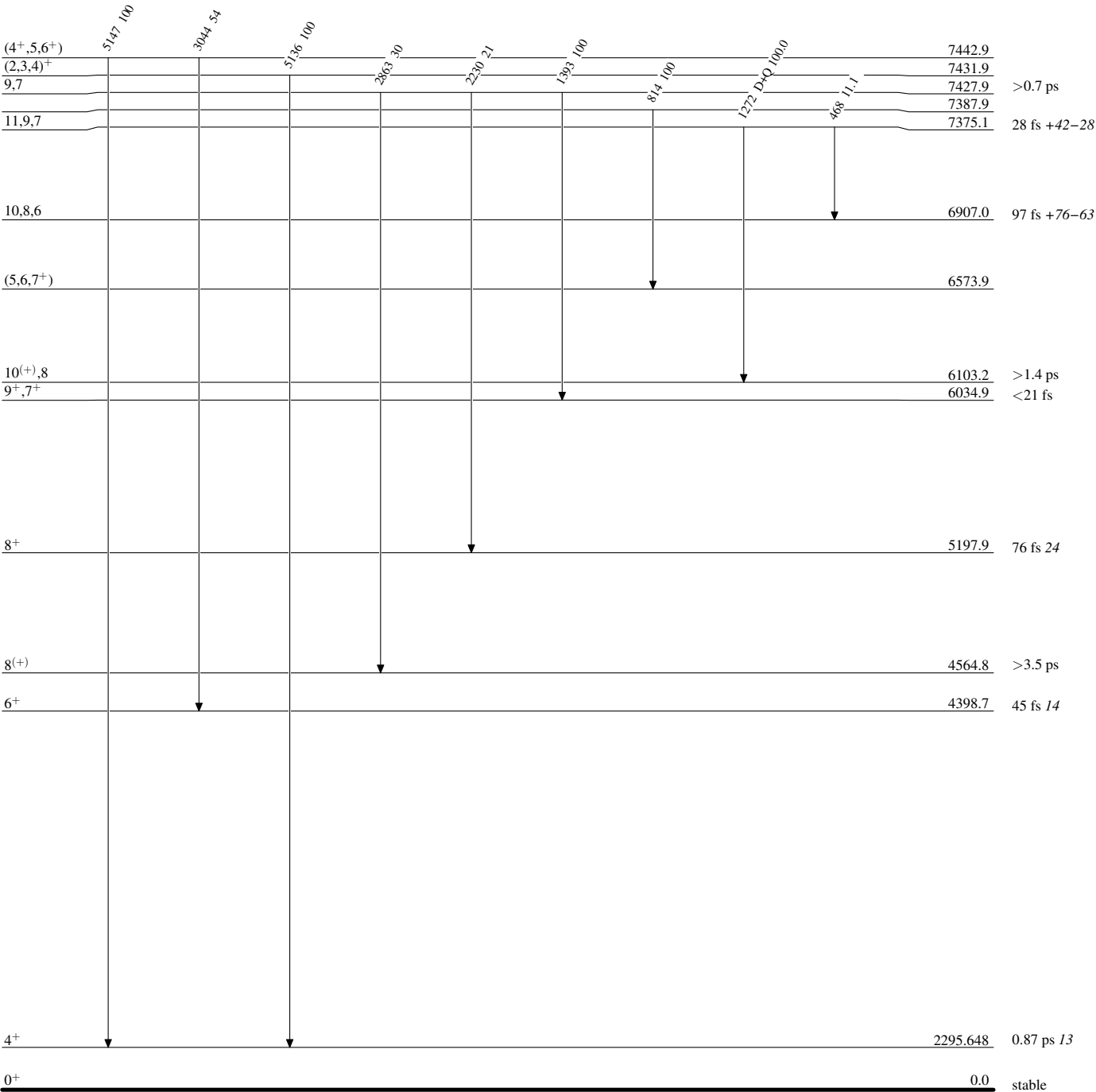
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

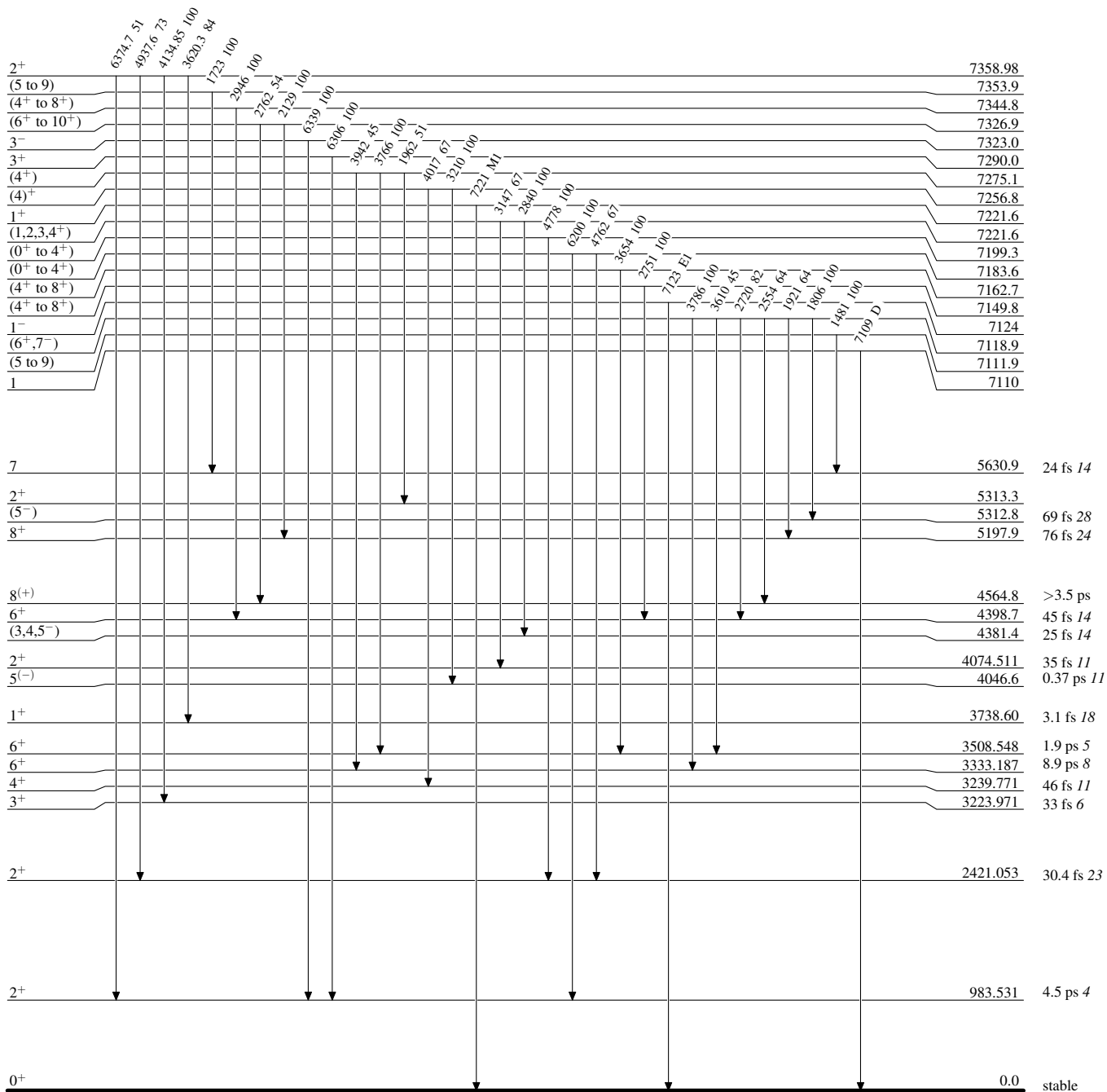
Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



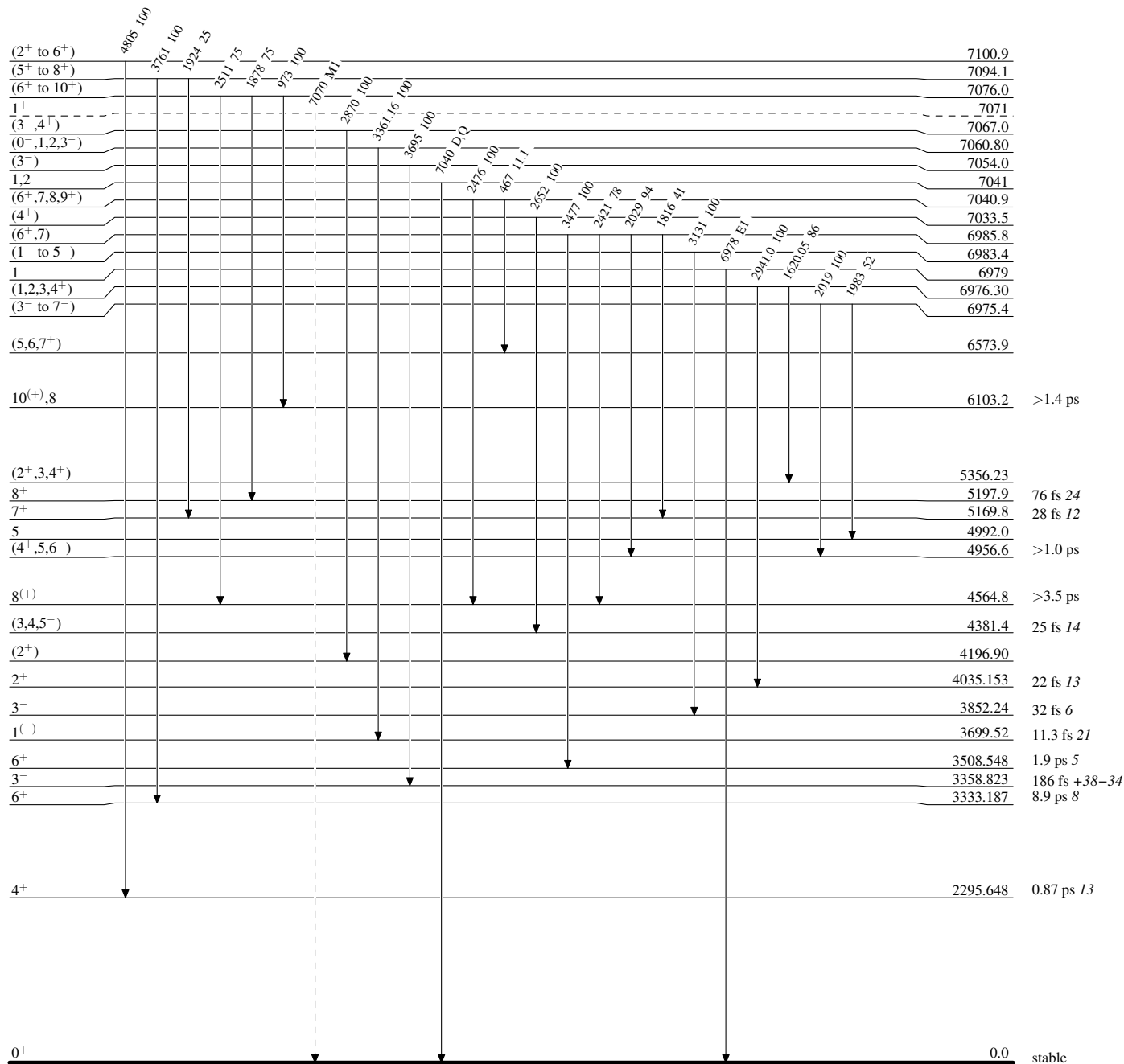
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

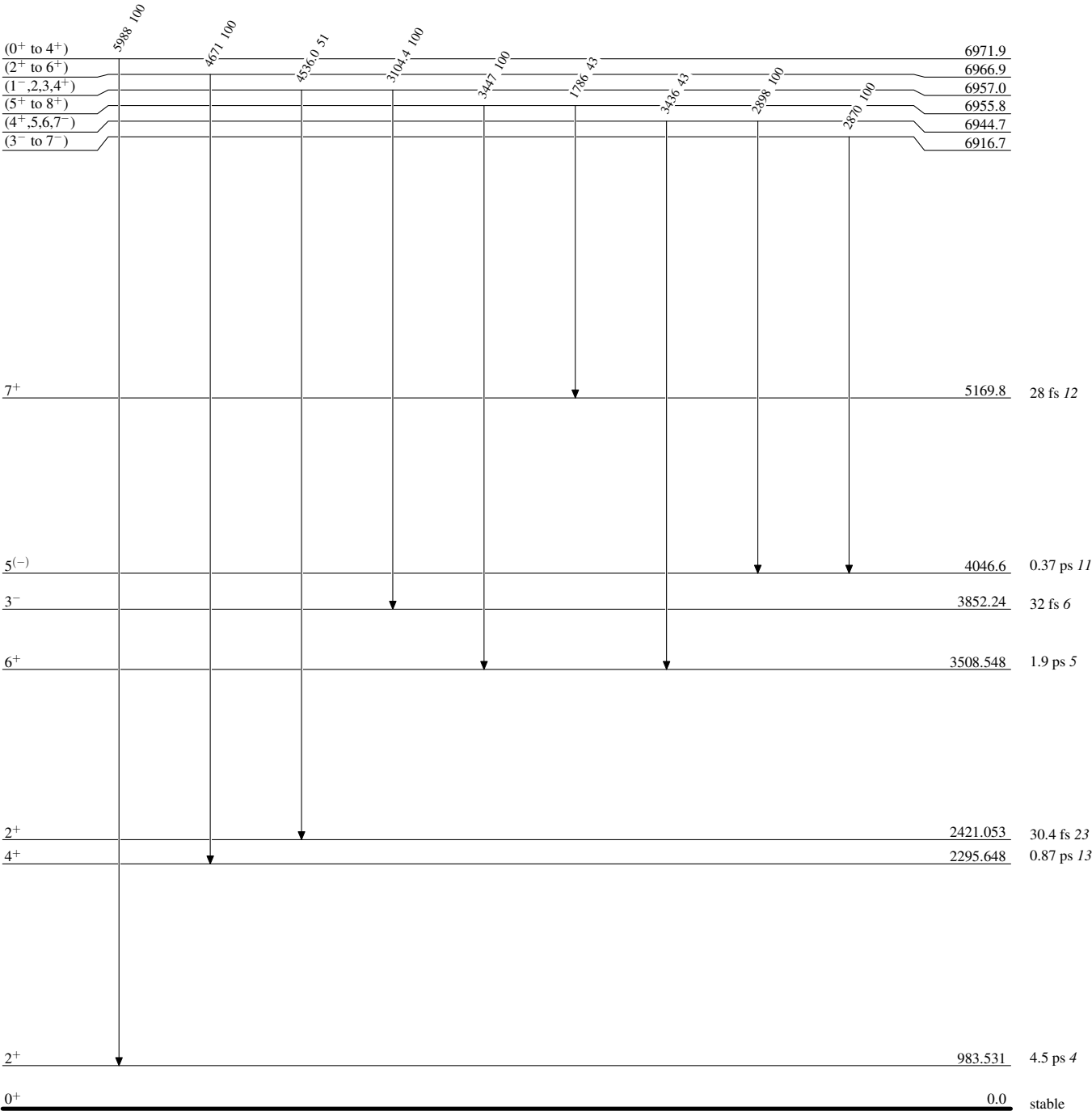
-----► γ Decay (Uncertain)



Adopted Levels, Gammas

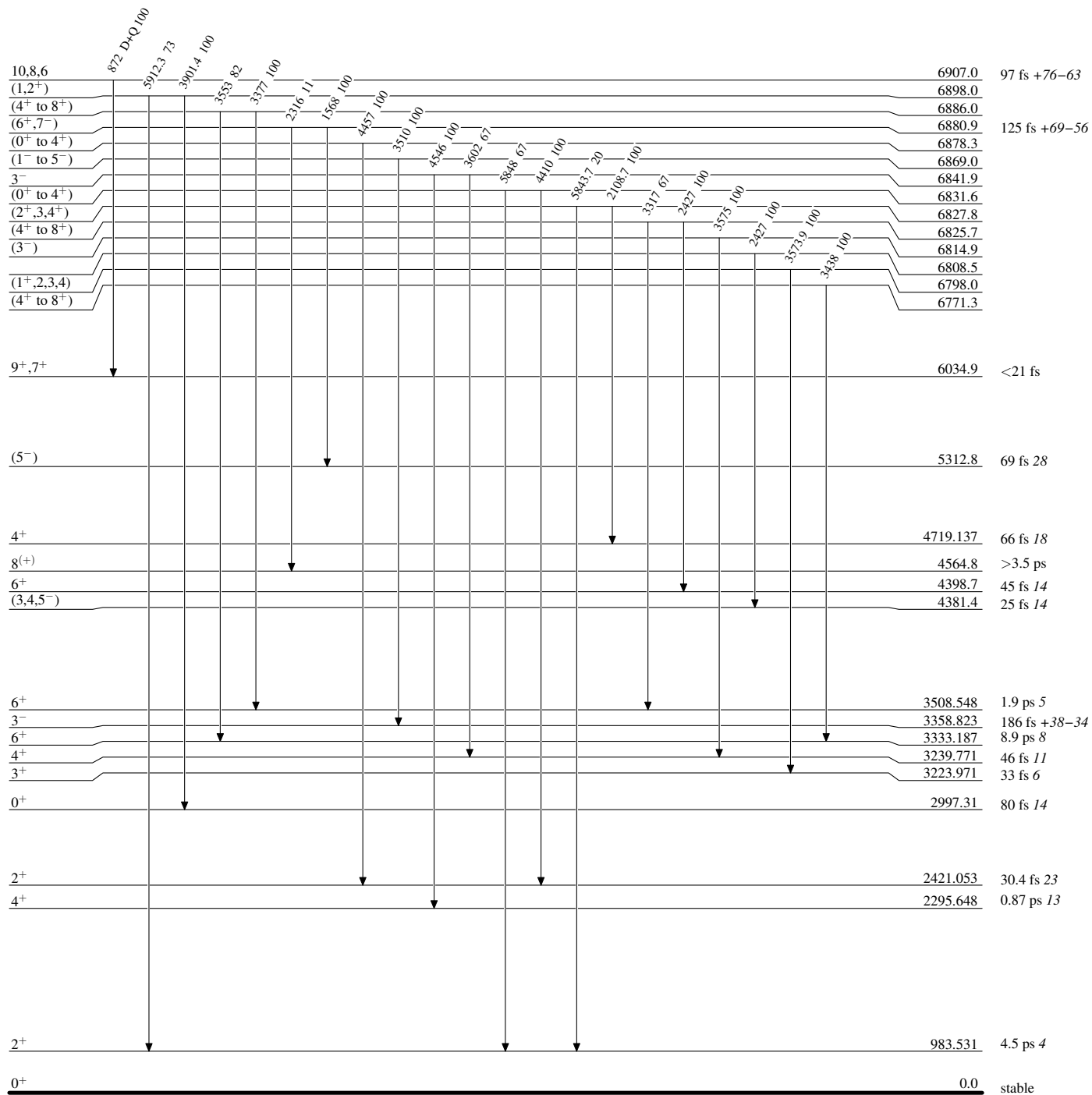
Level Scheme (continued)

Intensities: Relative photon branching from each level



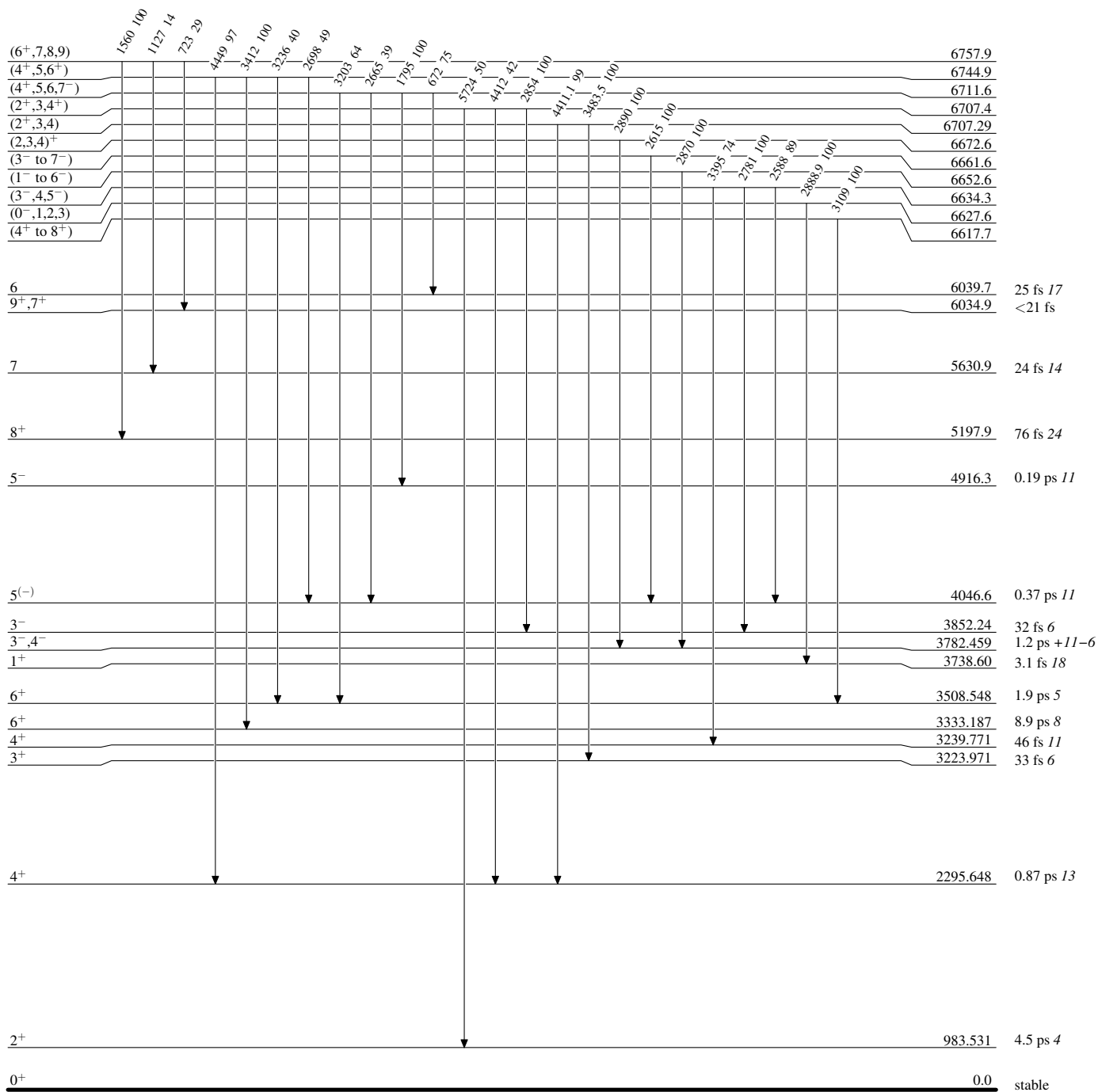
Adopted Levels, GammasLevel Scheme (continued)

Intensities: Relative photon branching from each level



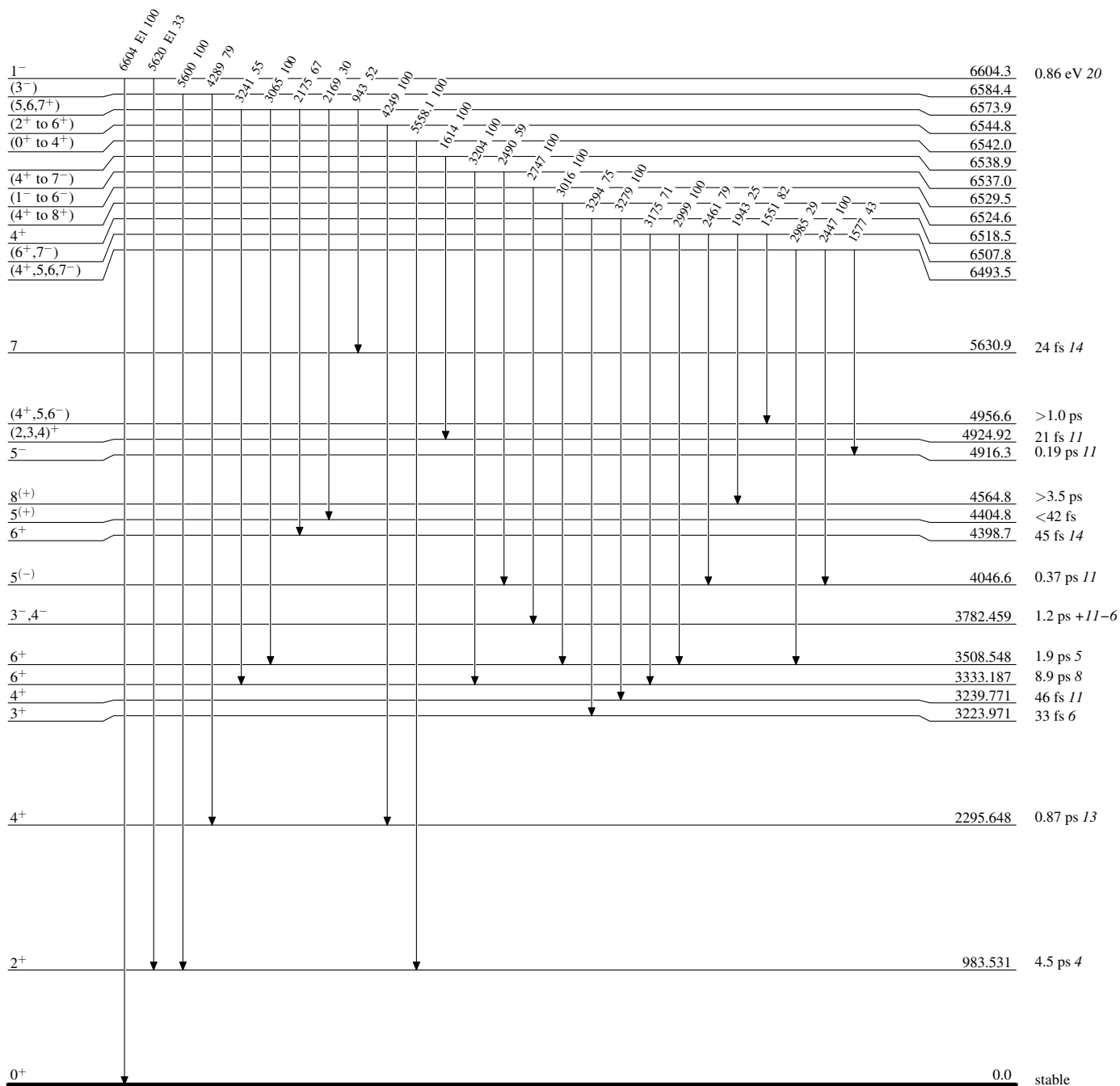
Adopted Levels, GammasLevel Scheme (continued)

Intensities: Relative photon branching from each level

 $^{48}_{22}\text{Ti}_{26}$

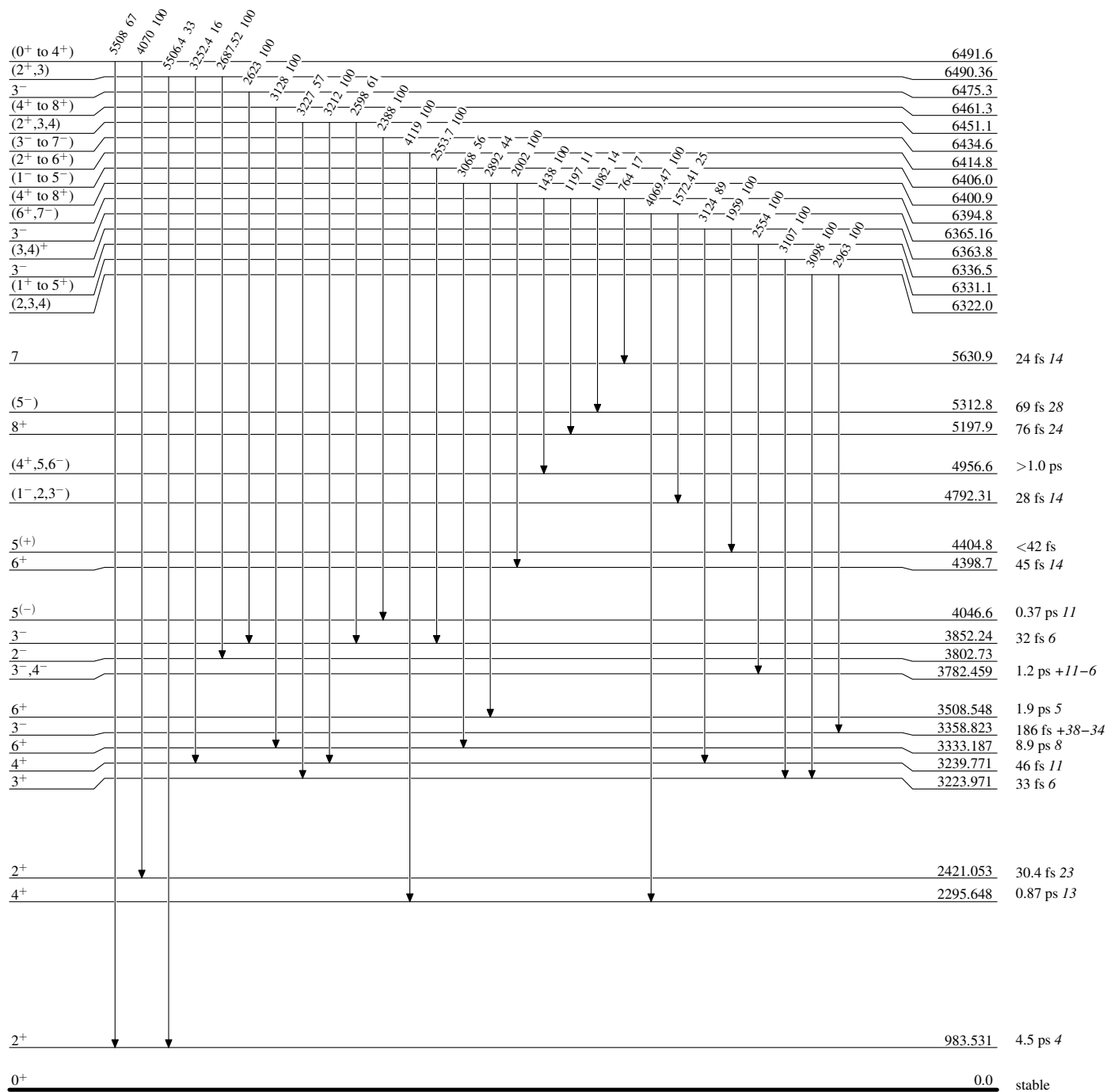
Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



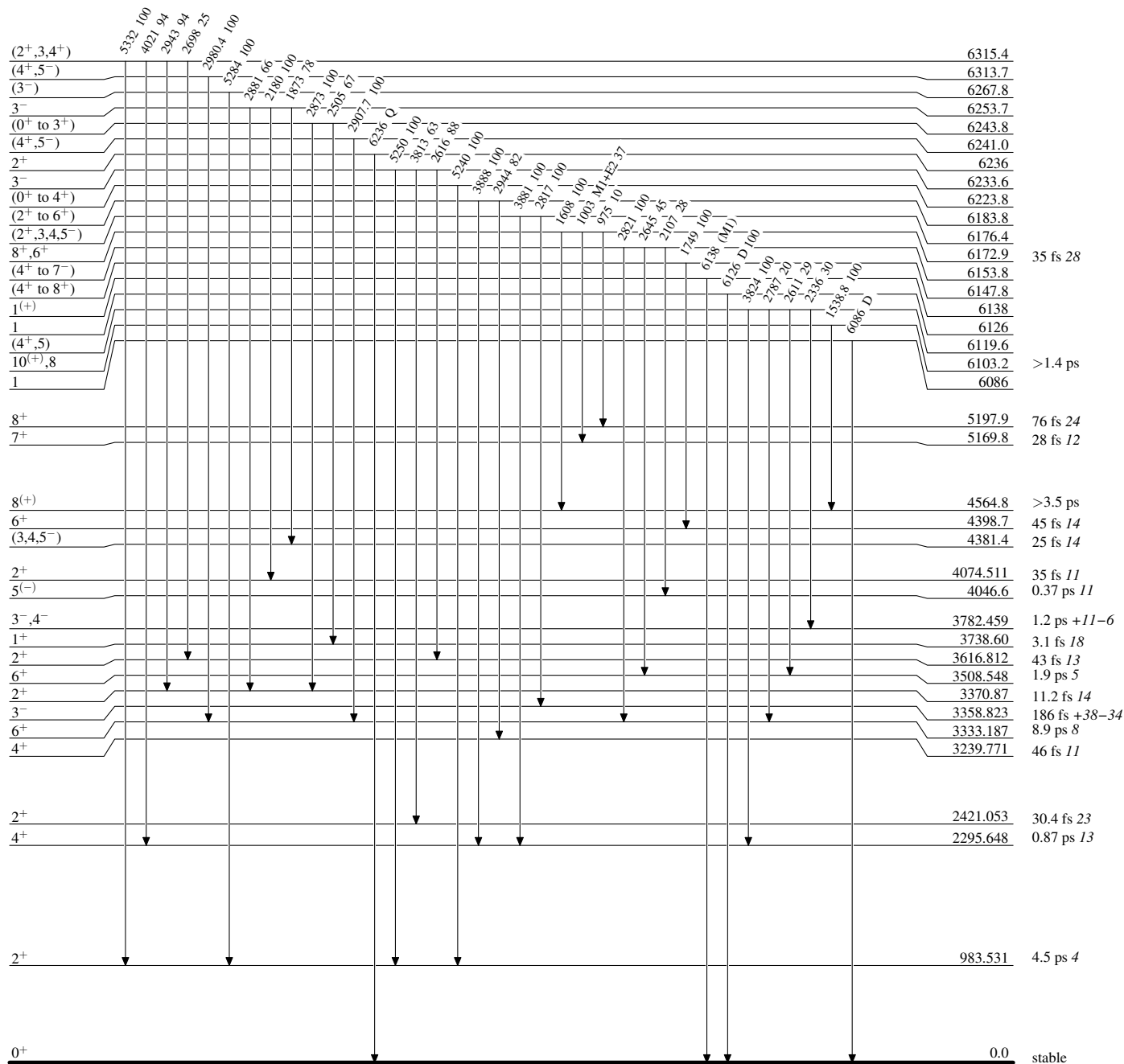
Adopted Levels, GammasLevel Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas**Level Scheme (continued)**

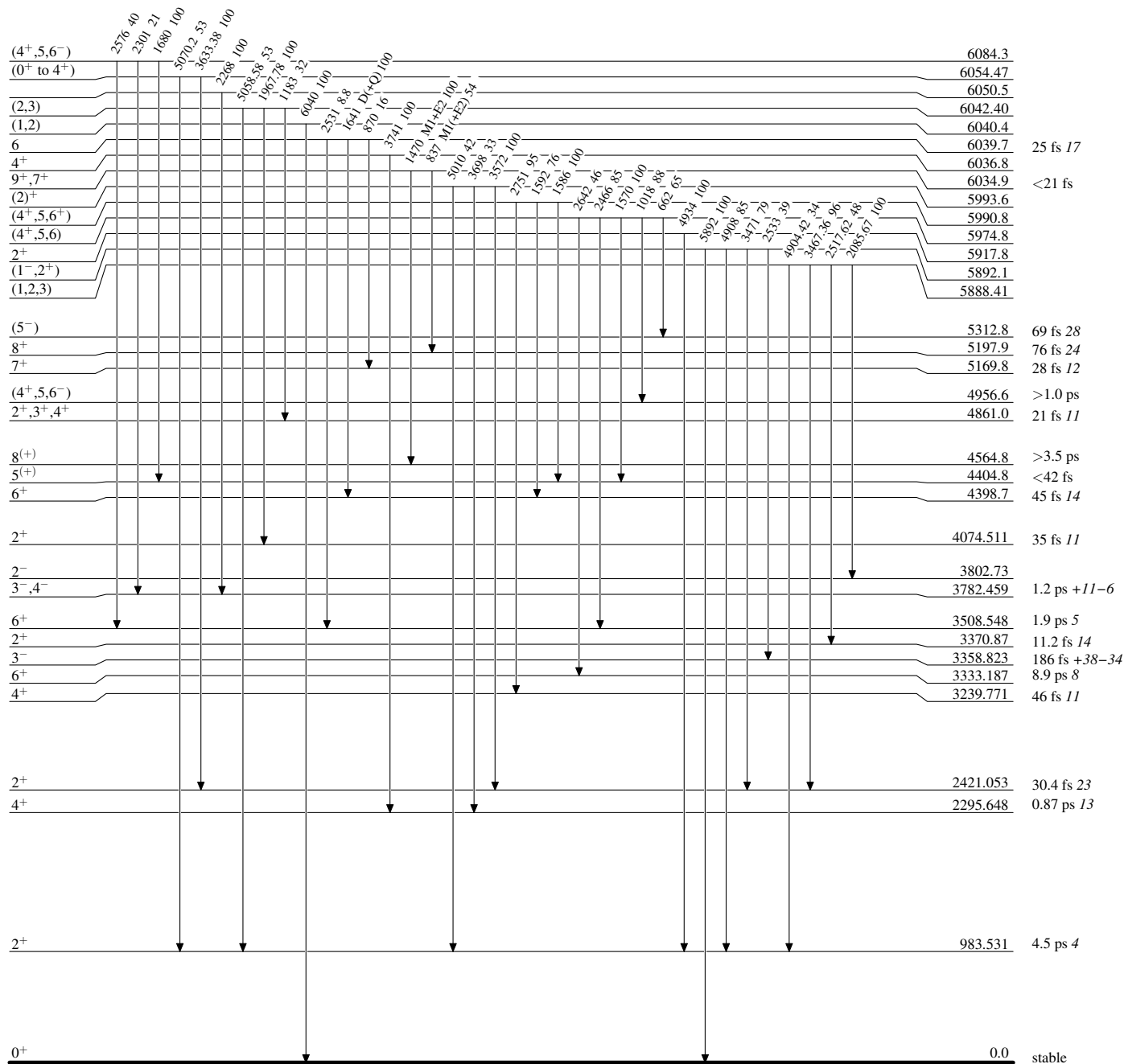
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

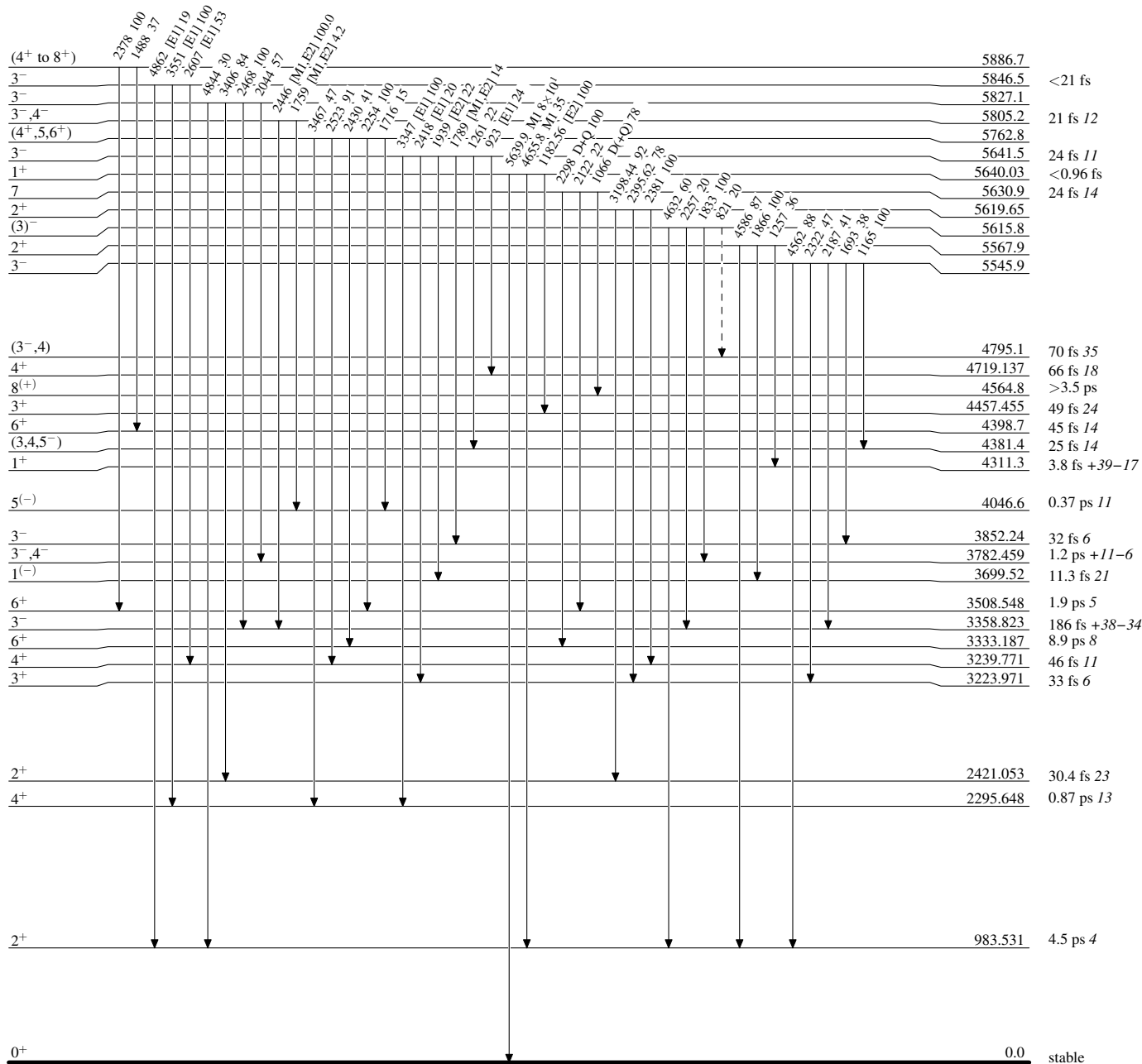


Adopted Levels, Gammas

Legend

Level Scheme (continued)

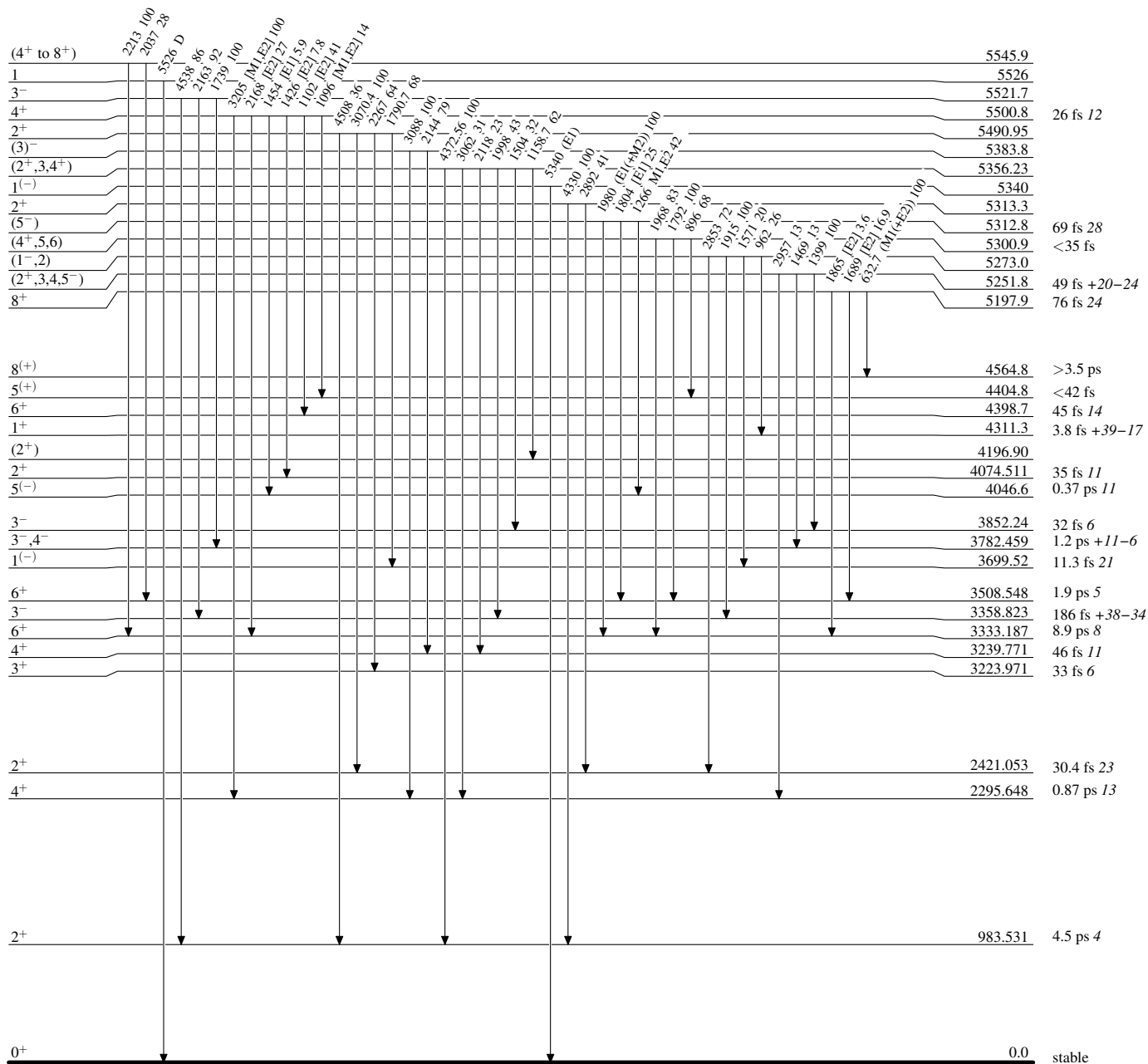
Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)


Adopted Levels, Gammas

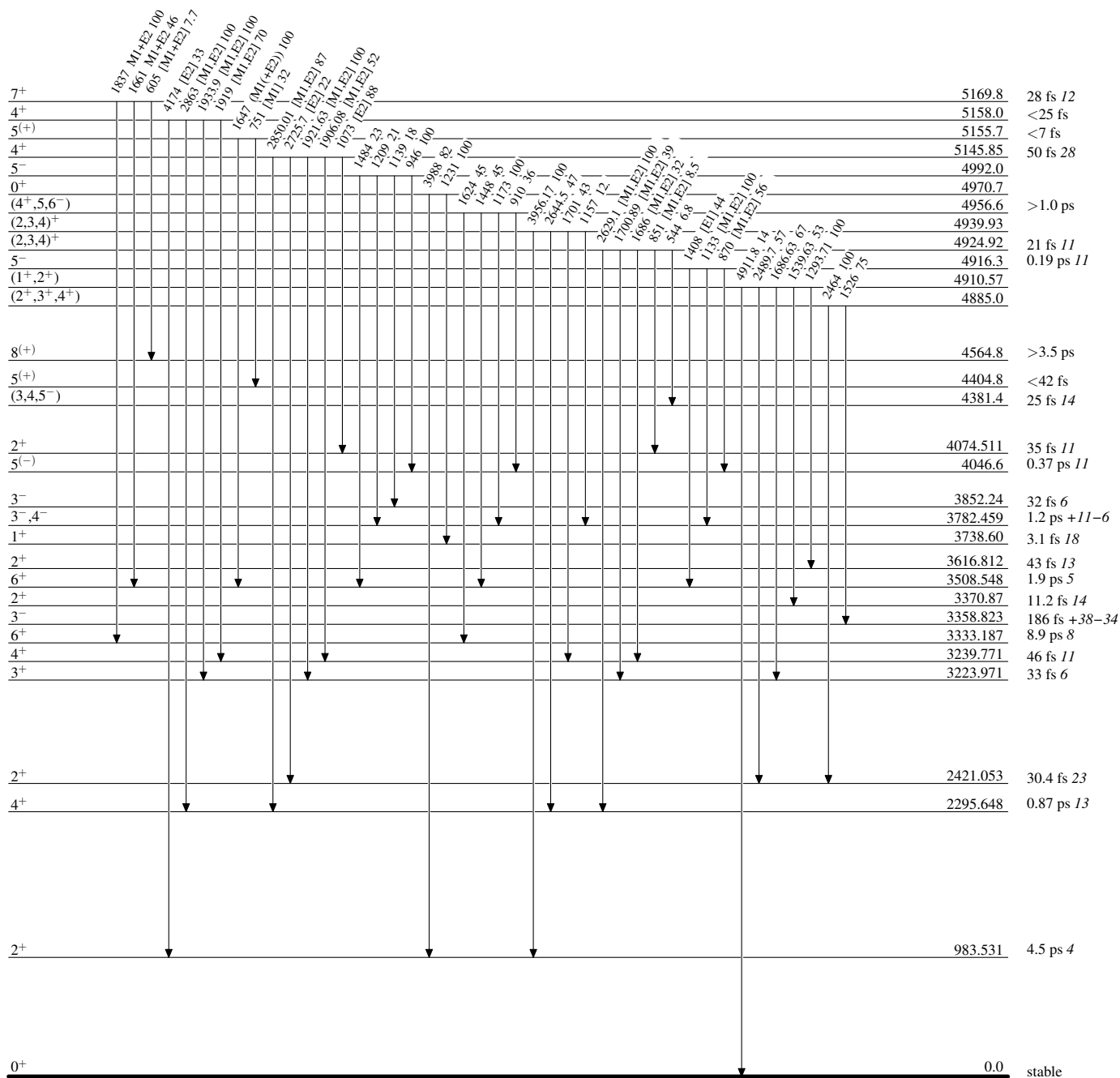
Level Scheme (continued)

Intensities: Relative photon branching from each level



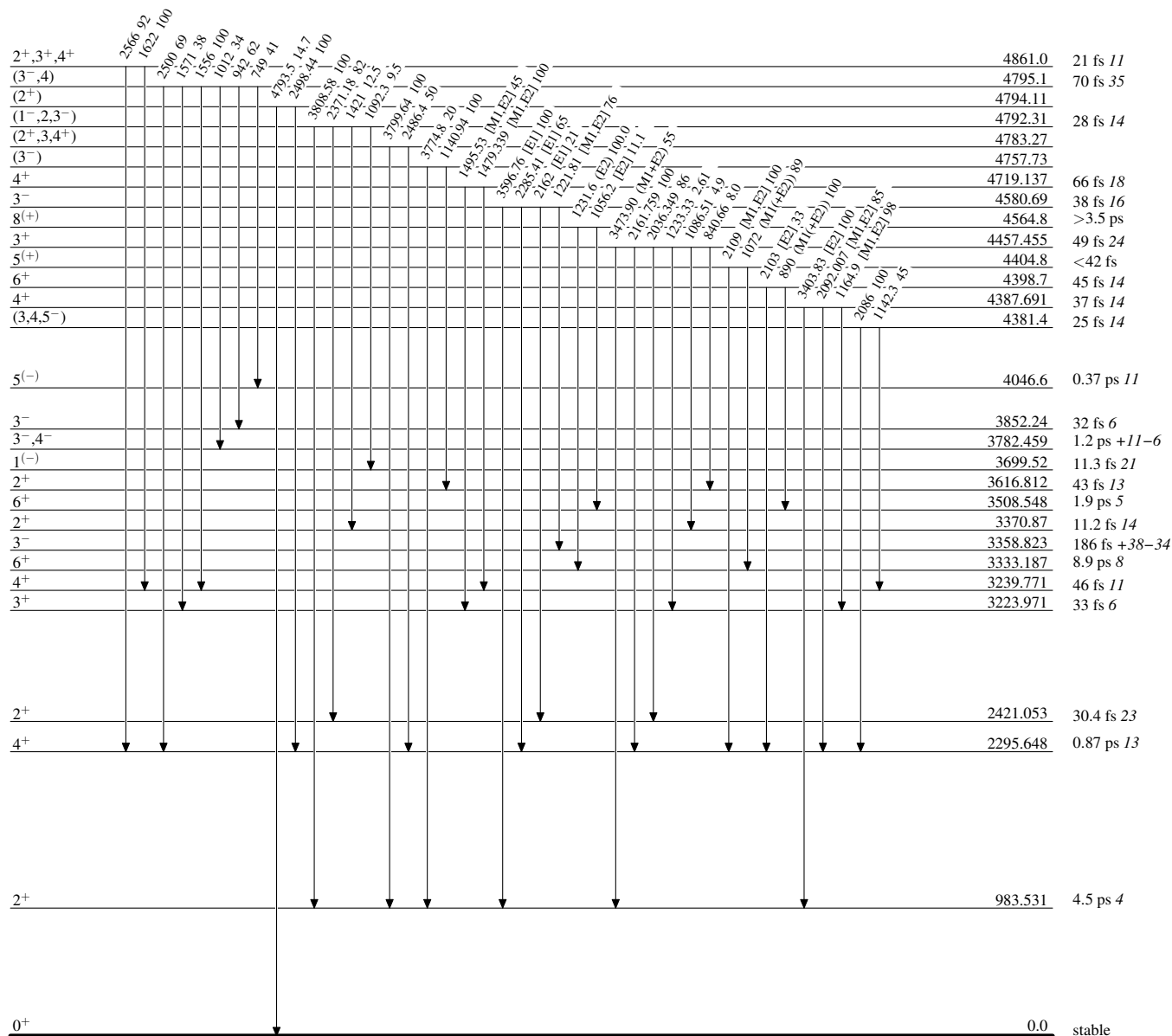
Adopted Levels, GammasLevel Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, GammasLevel Scheme (continued)

Intensities: Relative photon branching from each level

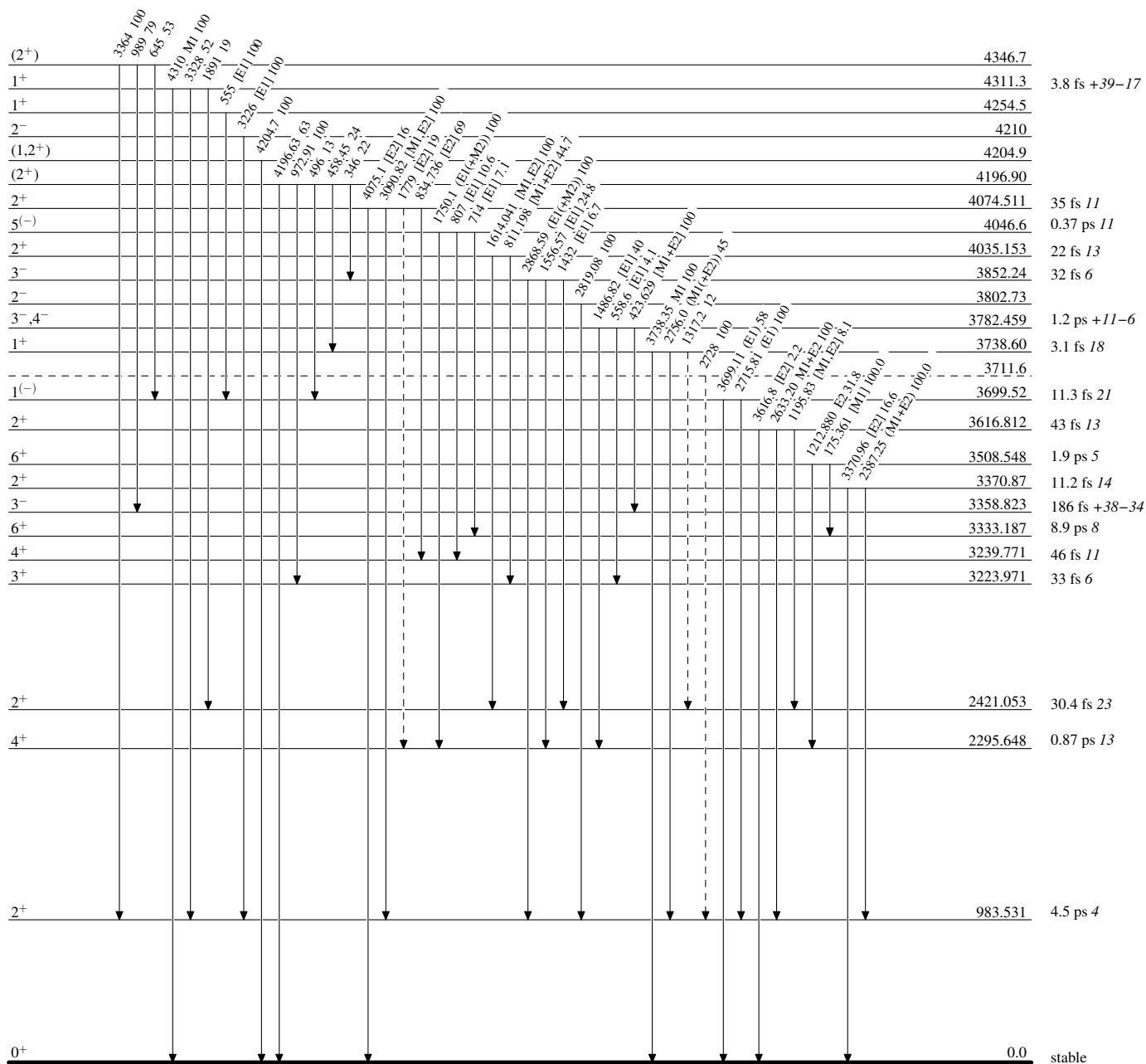


Adopted Levels, Gammas

Legend

Level Scheme (continued)

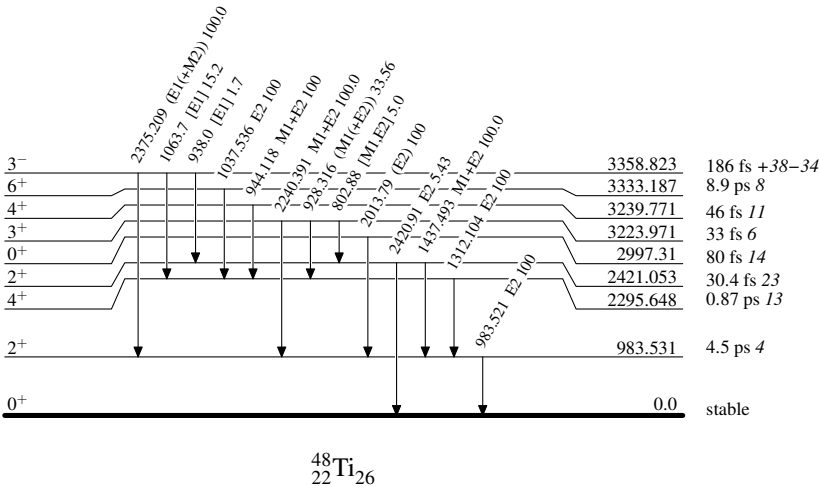
Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)


Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{48}_{22}\text{Ti}_{26}$