

Adopted Levels, Gammas

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

Q(β^-)=-13525 10; S(n)=16330 9; S(p)=8103 7; Q(α)=-7698 7 2021Wa16
 S(2n)=29492 14, S(2p)=13271 7, Q(ϵ)=1657 7 (2021Wa16).

Resonance parameters: see 1983Zu03 (²⁴Mg(²⁴Mg,²⁴Mg) and ²⁴Mg(²⁴Mg,²⁴Mg')), 1987Sa05 (²⁴Mg(²⁴Mg,²⁰Ne), ²⁴Mg(²⁴Mg,²⁴Mg), and ²⁴Mg(²⁴Mg,²⁴Mg')), 1987Wu01 (²⁴Mg(²⁴Mg,²⁴Mg')), 1990Wu03 ((²⁴Mg,²⁴Mg), (²⁴Mg,²⁴Mg'), (²⁴Mg,x)), 1993LeZY (²⁴Mg(²⁴Mg,X)), and 1994Ha03 ((²⁴Mg,²⁴Mg') and (²⁴Mg,²⁰Ne)) and references cited by these authors. See the Nuclear Science References library for theoretical calculations. See 1992Ra06 for an interpretation of some of these resonances as hyperdeformed states.

⁴⁸Cr Levels

1994Ca04 in (⁴⁰Ca,np γ) find no evidence for super- or hyperdeformation at higher energies as speculated by I. Ragnarsson in a private communication to 1994Ca04.

Cross Reference (XREF) Flags

A ⁴⁸ Mn β^+ decay (157.7 ms)	E ²⁸ Si(²⁸ Si, $2\alpha\gamma$)	I ⁴⁶ Ti(³ He,n γ)
B ⁴⁹ Fe β^+ p decay	F ³⁴ S(¹⁶ O, $2n\gamma$)	J ⁴⁸ Ti(π^+ , π^-)
C ¹⁰ B(⁴⁰ Ca,pn γ), ⁴⁰ Ca(¹⁰ B,pn γ)	G ³⁶ Ar(¹⁴ N,np γ)	K ⁵⁰ Cr(p,t)
D ²⁴ Mg(³² S, $2\alpha\gamma$),(³² S, ⁸ Be γ)	H ⁴⁶ Ti(³ He,n)	

E(level) [†]	J ^{π}	T _{1/2} [#]	XREF	Comments
0.0 ^{&}	0 ⁺	21.56 h 3	ABCDEFGHIJK	% ϵ +% β^+ =100 T _{1/2} : from 1974Ts01. Others: 21.55 h 15 from 1979PrZU; 22.96 h 5 from 1963Ho17 is discrepant.
752.16 ^{&} 13	2 ⁺	8.0 ps 5	ABCDEFGHI K	XREF: H(800). J ^{π} : L(p,t)=2 from 0 ⁺ ; 752.15 γ E2 to 0 ⁺ . T _{1/2} : weighted average of 8.43 ps 49 (2017Ar09), 7.3 ps 8 (1979Ek03), and 6.7 ps 18 (1973Ku10) in ⁴⁰ Ca(¹⁰ B,pn γ), using RDM. Other: 11.6 ps 15 from RDM in 1975Ha04 in (¹⁶ O, $2n\gamma$), which is re-analyzed to be 8.7 ps 24 by 1979Ek03 after removing a restriction imposed by 1975Ha04 on normalization constants for obtaining intensity ratio in RDM.
1858.40 ^{&} 22	4 ⁺	1.20 ps 13	ABCDEFG I K	XREF: K(1845). J ^{π} : L(p,t)=4 from 0 ⁺ ; 1106.3 γ E2 to 2 ⁺ . T _{1/2} : weighted average of 1.21 ps 13 from (³² S, $2\alpha\gamma$), 1.04 ps 35 from (²⁸ Si, $2\alpha\gamma$), and 1.3 ps 4 from (¹⁴ N,np γ), using DSAM. Other: 1.0 ps +14-4 from RDM in (¹⁰ B,pn γ), <3.5 ps from RDM in (¹⁶ O, $2n\gamma$).
3420? 20	(0 ⁺)		K	J ^{π} : L(p,t)=(0) from 0 ⁺ .
3444.8 ^{&} 4	6 ⁺	0.19 ps 5	A CDE G I K	J ^{π} : 1586.4 γ E2 to 4 ⁺ ; spin>4 from γ excitation function in (¹⁰ B,pn γ) (1979Ha45); band assignment. T _{1/2} : other: <0.7 ps from DSAM in (¹⁴ N,np γ) (1979Ek03).
3524.2 10	(0,1,2,3)		I k	XREF: k(3527). J ^{π} : <4 from γ -ray excitation functions in (³ He,n γ) (2003Je06).
3533.5 ^a 3	4 ⁽⁻⁾ @	3.3 ns 8	A C EFG I k	XREF: k(3527). J ^{π} : spin=4 from γ excitation function and $\gamma\gamma(\theta)$ in (³ He,n γ) (2003Je06); 4 ⁻ is proposed by 1998Br34 in (²⁸ Si, $2\alpha\gamma$) and the authors note that $\gamma(\theta)$ of 1973Ku10 (assigning 6 ⁺) in (¹⁰ B,pn γ) and 1975Ha04 (assigning 6 ⁺) and 1979Ha45 (assigning 6 ⁻) in (¹⁶ O, $2n\gamma$),

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Adopted Levels, Gammas (continued)

^{48}Cr Levels (continued)				
E(level) [†]	J^π	$T_{1/2}$ [#]	XREF	Comments
				which were interpreted as quadrupole, would also be consistent with $\Delta J=0$ dipole character and that negative parity is strongly suggested by systematics and 4^- is from shell-model prediction.
				$T_{1/2}$: weighted average of 4.1 ns 4 from $1675\gamma(t)$ in ($^{10}\text{B},pn\gamma$) (1979Ha45) and 2.5 ns 7 from RDM in ($^{14}\text{N},np\gamma$) (1979Ek03).
3632.2 10	(2 ⁺ ,3 ⁻)		I K	J^π : (<4) from γ excitation functions in ($^3\text{He},n\gamma$) (2003Je06); L(p,t)=(2,3) from 0 ⁺ .
4034.3 10	(0,1,2,3)		I	J^π : <4 from γ excitation functions in ($^3\text{He},n\gamma$) (2003Je06).
4064.1 4	3 ⁽⁻⁾		I k	$T_{1/2}$: from ($^{10}\text{B},pn\gamma$).
				J^π : ≤ 3 from γ excitation functions and ≥ 3 from $\gamma\gamma(\theta)$ in ($^3\text{He},n\gamma$) and $\pi=-$ suggested by shell-model calculations (2003Je06). L(p,t)=3 from 0 ⁺ for an unresolved doublet at 4067 5 (1972Sh27).
4064.2 ^a 4	5 ⁽⁻⁾ @	28 ps 7	A C EFG I k	J^π : spin=5 from γ excitation function and $\gamma\gamma(\theta)$ in ($^3\text{He},n\gamma$) (2003Je06); 530.77 γ M1+E2 to 4 ⁽⁻⁾ . L(p,t)=3 from 0 ⁺ for an unresolved doublet at 4067 5 (1972Sh27).
				$T_{1/2}$: from RDM in ($^{10}\text{B},pn\gamma$) (1979Ek03).
4280 5	(0 ⁺)			J^π : L(p,t)=(0) from 0 ⁺ .
4428.7 3	4 ⁺		A	XREF: K(4432).
4640 10	2 ⁺			J^π : L(p,t)=4 from 0 ⁺ ; allowed β feeding (log $ft=4.6$) from 4 ⁺ parent.
4653.0 3	(3,4) ⁺		A	J^π : L(p,t)=2 from 0 ⁺ .
4765.5 11	(4,5)		I	J^π : 3900.5 γ to 2 ⁺ ; allowed β feeding (log $ft=5.0$) from 4 ⁺ parent.
4876.0 ^a 4	(6 ⁻)	>0.7 ps	C E I	J^π : from γ excitation functions in ($^3\text{He},n\gamma$) (2003Je06). XREF: C(?).
				J^π : (5,6) from γ excitation functions in ($^3\text{He},n\gamma$) (2003Je06); 6 ⁻ from shell-model prediction (1998Br34).
5032.5 3	(3,4) ⁺		A	J^π : 4280.1 γ to 2 ⁺ ; allowed β feeding (log $ft=4.6$) from 4 ⁺ parent.
5131.2 11			I	
5188.4& 5	8 ⁺	0.14 ps 4	CDE G I	J^π : spin=8 from $\gamma\gamma(\text{DCO})$ in ($^{28}\text{Si},2\alpha\gamma$) (1996Ca38); 1743.5 γ E2 to 6 ⁺ ; band assignment.
				$T_{1/2}$: other: <0.8 ps from ($^{14}\text{N},np\gamma$) (1979Ek03); a value of 0.52 ps 17 is from DSAM in 1979Ek03, but not adopted in their level scheme.
5294.0 7	3 ⁺ ,4 ⁺ ,5 ⁺		A	J^π : allowed β^+ feeding (log $ft=4.9$) from 4 ⁺ parent.
5430 30	0 ⁺		H	J^π : L($^3\text{He},n$)=0 from 0 ⁺ .
5595.5 11			I	
5608.6? 5	(3 ⁺ ,4 ⁺)		A	J^π : possible allowed β^+ feeding from 4 ⁺ parent; possible 4856.1 γ to 2 ⁺ .
5649.0 ^a 4	(7 ⁻)	0.42 ps 7	C E I	XREF: C(?).
				J^π : from band assignment and shell-model predictions (1998Br34).
5670 20	(0 ⁺)			J^π : L(p,t)=(0) from 0 ⁺ .
5784.9 11			I	
5792.7 3	4 ⁺		A	T=1 E(level): IAS ^{48}V g.s. J^π : L(p,t)=4 from 0 ⁺ .
5834.5 11			I	
5960 10	(0 ⁺)		H K	XREF: H(6010).
				J^π : L(p,t)=(0) from 0 ⁺ .
6100 10	2 ⁺			T=1 E(level): IAS ^{48}V 308 level.
				J^π : L(p,t)=2 from 0 ⁺ .
6257.5? 10			E	J^π : (9 ⁺) suggested by 1998Le43 in ($^{28}\text{Si},2\alpha\gamma$); no discussion by authors.
6278.4? 11		0.14 ps 3	E	E(level): this level with J=8 is proposed in 1996Ca38 only in ($^{28}\text{Si},2\alpha\gamma$) and could be the same level as the 9871 level proposed by 1998Br34, which has the similar deexciting gamma and nearly identical $T_{1/2}$ from DSAM.
				$T_{1/2}$: from DSAM in ($^{28}\text{Si},2\alpha\gamma$) (1996Ca38).
6420 10	(5 ⁻)		K	J^π : L(p,t)=(5) from 0 ⁺ .

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Adopted Levels, Gammas (continued)

⁴⁸Cr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [#]	XREF	Comments
6855 10	0 ⁺		K	J ^π : L(p,t)=0 from 0 ⁺ .
7064.0 ^{&} 7	10 ⁺	0.125 ps 35	CDE G	J ^π : spin>8 from γ excitation function in (¹⁰ B,pnγ) (1979Ha45); 1875.6γ to 8 ⁺ is stretched (ΔJ=2) quadrupole or ΔJ=0 dipole, and can not be M2 based on RUL. T _{1/2} : other: <0.7 ps indicated by the width of 1878γ in (¹⁴ N,npγ) (1979Ek03). Evidence for spin alignment from backbending in (⁴⁰ Ca,npγ).
7550 10			K	
7671.2 ^a 5	(9 ⁻)	0.15 ps 5	C E	J ^π : from band assignment an shell-model prediction (1998Br34).
7940 30			H	
8411.9 ^{&} 8	12 ⁺	0.59 ps 17	CDE	J ^π : spin from γγ(DCO) in (²⁸ Si,2αγ) (1996Ca38); 1347.9γ E2 to 10 ⁺ ; band assignment.
8462.6? 15			E	
8750 [‡] 15	0 ⁺		h jK	T=2 XREF: h(8770)j(8620). J ^π : L(p,t)=0 from 0 ⁺ .
8760 [‡] 15	0 ⁺		h jK	T=2 XREF: h(8770)j(8620). J ^π : L(p,t)=0 from 0 ⁺ .
9040? 30			K	
9180? 30			K	
9530 30	0 ⁺		H	E(level): IAS(⁴⁸ V,3.70 MeV). J ^π : L(³ He,n)=0 from 0 ⁺ .
9871.4 ^a 6	(11 ⁻)	0.139 ps 35	C E	E(level): see a possible level at E=6278, which could the same level as this level based on the de-exciting gamma and T _{1/2} . J ^π : from band assignment and shell-model prediction (1998Br34).
9900 30			H	
10280.9 ^{&} 9	14 ⁺	0.30 ps 6	DE	J ^π : 1868.9γ E2 to 12 ⁺ ; member of g.s. band.
11105.6? 18			E	
11320 30	0 ⁺		H	J ^π : L(³ He,n)=0 from 0 ⁺ .
11648.8 ^a 7	(13 ⁻)	0.48 ps 14	E	J ^π : from band assignment and shell-model prediction (1998Br34).
12301.5 ^a 10			E	
13310.0 ^{&} 9	16 ⁺	0.049 ps 10	DE	J ^π : 3029.0γ E2 to 14 ⁺ ; member of g.s. band.
15119.0 ^a 10			E	
15735.2 13			DE	J ^π : (16 ⁺) suggested by (1998Br34) in (²⁸ Si,2αγ); no discussion by authors.
17342.1 ^a 15			E	
17378.2? ^{&} 10			E	

[†] From a least-squares fit to γ-ray energies assuming ΔEγ=1 keV where not given for levels connected by γ-ray transitions, and from particle transfer reactions in other cases, unless otherwise noted.

[‡] Identified as doublet T=2, J^π=0⁺ state in (p,t).

[#] From DSAM line-shape analysis in (²⁸Si,2αγ) (1998Br34), unless otherwise noted.

@ ⁴⁸Cr is a well-deformed nucleus with β≈0.3 suggesting that K is a good quantum number (1998Br34). The band head at 3533 has J=4 from excit. and the state directly above this connected by 531γ has J=5 from excit., establishing K=4. δ(1675γ) excludes an appreciable Q component and strongly favors Δπ=-. T_{1/2}(3533)=3.3 ns 8 and almost pure D character of 1675γ excludes twofold K-forbidden E2. However, threefold K-forbidden, isospin-forbidden E1 and twofold K-forbidden M2 are consistent with expected transition probabilities. Therefore, π=- is assigned to the 3533 and the band built on it. Note, also, that, if π(3533)=+, considerable E2 character of the 1675γ and an E2 γ to 2⁺ would be expected and that no γ from the 4064, J=5, to 1854, J=4⁺ was observed. Arguments from 2003Je06 in ⁴⁶Ti(³He,nγ). See additional arguments by 1998Br34 in (²⁸Si,2αγ) supporting J^π(3533)=4⁻. Note that Mult(87γ)=D,E2 from comparison to RUL is not consistent with this assignment.

Adopted Levels, Gammas (continued) **${}^{48}\text{Cr}$ Levels (continued)**

- [&] Band(A): g.s. (yrast) band. [1994Ca04](#) in (${}^{40}\text{Ca},n\gamma$) reverse the order of the 1744γ and 1876γ and, therefore, place the 8^+ member of the band at 5318 keV. Data from the other studies indicate that the 8^+ is at 5188 keV and this has been adopted by the evaluator. The odd-spin members of the band have been assigned only by [1994Ca04](#).
- ^a Band(B): Rotational-like structure based on 4^- ([1998Br34,1998Le43,2003Je06](#)). Possible $(d_{3/2})^1(f_{7/2})^9$ configuration. Members of the band for states above 11648 are from figure 1 of [1998Le43](#) and were not discussed by [1998Br34](#). [2003Je06](#) labeled this as a negative parity nonyrast band and only reported the first four members.

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Cr})$									
$E_i(\text{level})$	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult. &	δ &	α^\dagger	Comments
752.16	2 ⁺	752.15 13	100	0.0	0 ⁺	E2		0.000325 5	B(E2)(W.u.)=28.4 +19-17 α (K)=0.000325 5; α (K)=0.000294 4; α (L)= 2.73×10^{-5} 4; α (M)= 3.59×10^{-6} 5 α (N)= 1.337×10^{-7} 19 E _γ : weighted average of 752.1 2 from ⁴⁸ Mn β ⁺ decay, 752.2 2 from ⁴⁹ Fe β ⁺ p decay, 752.0 2 from (¹⁰ B,pnγ), 752.2 3 from (²⁸ Si,2αγ), 752.3 2 from (¹⁶ O,2nγ), 752.13 13 from (¹⁴ N,npγ), and 752.4 5 from (³ He,nγ).
1858.40	4 ⁺	1106.3 2	100	752.16	2 ⁺	E2		0.0001234 17	B(E2)(W.u.)=27.5 +32-27 α (K)=0.0001234 17; α (K)=0.0001106 15; α (L)= 1.024×10^{-5} 14; α (M)= 1.347×10^{-6} 19 α (N)= 5.05×10^{-8} 7; α (IPF)= 1.104×10^{-6} 17 E _γ : weighted average of 1106.1 2 from ⁴⁸ Mn β ⁺ decay, 1105.2 6 from ⁴⁹ Fe β ⁺ p decay, 1106.3 2 from (¹⁰ B,pnγ), 1106.4 3 from (²⁸ Si,2αγ), 1106.5 2 from (¹⁶ O,2nγ), 1106.4 3 from (¹⁴ N,npγ), and 1106.4 5 from (³ He,nγ). Mult.: Q from γ(θ) data, M2 ruled out by RUL.
3444.8	6 ⁺	1586.4# 3	100	1858.40	4 ⁺	E2		0.0001789 25	B(E2)(W.u.)=29 +10-6 α (K)=0.0001789 25; α (K)= 5.10×10^{-5} 7; α (L)= 4.70×10^{-6} 7; α (M)= 6.19×10^{-7} 9 α (N)= 2.329×10^{-8} 33; α (IPF)=0.0001226 17 E _γ : others: 1586.4 6 in (¹⁰ B,pnγ); 1589.2 10 from (¹⁴ N,npγ) (1979Ek03) is discrepant, which is a quite broad peak as mentioned in 1979Ek03.
3524.2	(0,1,2,3)	2772@	100	752.16	2 ⁺				
3533.5	4 ⁽⁻⁾	87 ^a	10	3444.8	6 ⁺	[M2]		0.447 6	α (K)=0.399 6; α (L)=0.0429 6; α (M)=0.00564 8 α (N)=0.0001953 27 E _γ : from (⁴⁰ Ca,pnγ) (1994Ca04). I _γ : from I(87γ)/I(1675γ)=0.6/6 in (⁴⁰ Ca,pnγ) (1994Ca04). B(M2)(W.u.)= 9.2×10^3 +38-31 exceeds RUL=1. B(E1)(W.u.)= 2.1×10^{-8} +18-9; B(M2)(W.u.)< 2.3×10^{-4} α =0.000427 6; α (K)= 2.50×10^{-5} 4; α (L)= 2.30×10^{-6} 4; α (M)= 3.02×10^{-7} 5 α (N)= 1.140×10^{-8} 18; α (IPF)=0.000399 6 E _γ : weighted average of 1675.0 4 from ⁴⁸ Mn β ⁺ decay, 1675.3 4 from (¹⁰ B,pnγ), 1674.9 6 from (¹⁶ O,2nγ), 1675.3 3 from (¹⁴ N,npγ), and 1675.3 10 from (³ He,nγ). I _γ : from ⁴⁸ Mn β ⁺ decay. Other: 100 20 from (¹⁰ B,pnγ). Mult.,δ: D(+Q) from γγ(θ) in (³ He,nγ); Δπ=(yes) from level scheme.
		1675.2 3	100 7	1858.40	4 ⁺	(E1(+M2))	-0.01 5	0.000427 6	

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Cr})$ (continued)									
$E_i(\text{level})$	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult. &	δ &	α^\dagger	Comments
3533.5	4 ⁽⁻⁾	2780.3 ^a	<80	752.16	2 ⁺				E_γ, I_γ : from (¹⁰ B,pn γ) (1973Ku10); not observed in (³ He,n γ).
3632.2	(2 ⁺ ,3 ⁻)	2880 [@]	100	752.16	2 ⁺				
4034.3	(0,1,2,3)	3282 [@]	100	752.16	2 ⁺				
4064.1	3 ⁽⁻⁾	530.75 17	100 20	3533.5	4 ⁽⁻⁾	D+Q	-0.36 +28-6l		E_γ : weighted average of 530.8 3 from (¹⁰ B,pn γ), 531.0 3 from (²⁸ Si,2 $\alpha\gamma$), 530.6 2 from (¹⁶ O,2n γ), and 530.77 17 from (¹⁴ N,np γ).
		2205 [@]	100 [@] 8	1858.40	4 ⁺	D,Q			Mult.: from $\gamma\gamma(\theta)$ in (³ He,n γ), with $\delta(Q/D)=-0.05$ 5 or ≥ 10 (2003Je06).
4064.2	5 ⁽⁻⁾	3312 [@] 530.77 17	38 [@] 4 100	752.16 3533.5	2 ⁺ 4 ⁽⁻⁾	M1+E2	0.24 3	0.000477 9	B(M1)(W.u.)=0.0050 +17-10; B(E2)(W.u.)=2.5 +11-7 $\alpha=0.000477$ 9; $\alpha(K)=0.000431$ 8; $\alpha(L)=4.01\times 10^{-5}$ 8; $\alpha(M)=5.27\times 10^{-6}$ 10 $\alpha(N)=1.98\times 10^{-7}$ 4 E_γ : from (¹⁴ N,np γ). Others: 531.0 5 from ⁴⁸ Mn β^+ decay, 530.8 3 from (¹⁰ B,pn γ), 531.0 3 from (²⁸ Si,2 $\alpha\gamma$), and 530.6 2 from (¹⁶ O,2n γ).
									Mult., δ : D+Q from $\gamma(\theta)$ in (¹⁰ B,pn γ), with $\delta(Q/D)$ deduced by the evaluator from 5.5% 15-10 E2 component in 1979Ha45; M2 ruled out by RUL. Others: $\delta(Q/D)=-0.36$ +28-6l from $\gamma(\theta)$ in (¹⁶ O,2n γ) (1975Ha04), +0.01 5 or >7 from $\gamma\gamma(\theta)$ in (³ He,n γ) (2003Je06), >20 for $J^\pi=6^-$ from $\gamma(\theta)$ in (¹⁴ N,np γ) (1979Ek03).
4428.7	4 ⁺	2570.2 [‡] 5 3676.2 [‡] 4	5.2 [‡] 6 100 [‡] 6	1858.40 752.16	4 ⁺ 2 ⁺				
4653.0	(3,4) ⁺	3900.5 [‡] 5	100	752.16	2 ⁺				
4765.5	(4,5)	2907 [@]	100	1858.40	4 ⁺				
4876.0	(6 ⁻)	811.9 ^{#a} 3	37 [#] 7	4064.2	5 ⁽⁻⁾			0.00022 4	$\alpha=0.00022$ 4; $\alpha(K)=0.00020$ 4; $\alpha(L)=1.9\times 10^{-5}$ 4; $\alpha(M)=2.5\times 10^{-6}$ 5; $\alpha(N+..)=9.3\times 10^{-8}$ 17 $\alpha(N)=9.3\times 10^{-8}$ 17
		1342.6 [#] 3	100 [#] 17	3533.5	4 ⁽⁻⁾	[E2]		0.0001185 17	B(E2)(W.u.)<14 $\alpha=0.0001185$ 17; $\alpha(K)=7.19\times 10^{-5}$ 10; $\alpha(L)=6.64\times 10^{-6}$ 9; $\alpha(M)=8.74\times 10^{-7}$ 12 $\alpha(N)=3.28\times 10^{-8}$ 5; $\alpha(IPF)=3.90\times 10^{-5}$ 6 E_γ : other: 1343 3 from (¹⁰ B,pn γ).
5032.5	(3,4) ⁺	3174.1 [‡] 5 4280.1 [‡] 5	24.9 [‡] 34 100 [‡] 6	1858.40 752.16	4 ⁺ 2 ⁺				
5131.2		1067 [@]	100	4064.2	5 ⁽⁻⁾				

Adopted Levels, Gammas (continued)

$\gamma(^{48}\text{Cr})$ (continued)									
$E_i(\text{level})$	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.&	α^\dagger	Comments	
5188.4	8 ⁺	1743.5 3	100	3444.8	6 ⁺	E2	0.0002385 33	B(E2)(W.u.)=24 +10-6 $\alpha=0.0002385$ 33; $\alpha(\text{K})=4.24\times 10^{-5}$ 6; $\alpha(\text{L})=3.91\times 10^{-6}$ 5; $\alpha(\text{M})=5.14\times 10^{-7}$ 7 $\alpha(\text{N})=1.937\times 10^{-8}$ 27; $\alpha(\text{IPF})=0.0001917$ 27 E_γ : weighted average of 1742.5 10 from (¹⁰ B,pn γ), 1743.4 3 from (²⁸ Si,2 $\alpha\gamma$), and 1744.0 5 from (¹⁴ N,np γ). Mult.: from $\gamma(\theta,\text{pol})$ in (¹⁴ N,np γ) (1979Ek03), and γ anisotropy ($\Delta J=0$ or 2) in (⁴⁰ Ca,pn γ) (1994Ca04).	
5294.0	3 ⁺ ,4 ⁺ ,5 ⁺	3435.5 [‡] 6	100	1858.40	4 ⁺				
5595.5		2062 [@]	100	3533.5	4 ⁽⁻⁾				
5608.6?	(3 ⁺ ,4 ⁺)	3750.0 ^{‡a}	100 [‡] 18	1858.40	4 ⁺				
		4856.1 ^{‡a}	50 [‡] 9	752.16	2 ⁺				
5649.0	(7 ⁻)	773.1 [#] 3	5.0 [#] 10	4876.0	(6 ⁻)		0.00025 5	$\alpha=0.00025$ 5; $\alpha(\text{K})=0.00023$ 5; $\alpha(\text{L})=2.1\times 10^{-5}$ 5; $\alpha(\text{M})=2.8\times 10^{-6}$ 6; $\alpha(\text{N}+..)=1.04\times 10^{-7}$ 20 $\alpha(\text{N})=1.04\times 10^{-7}$ 20	
		1584.6 [#] 3	100 [#] 10	4064.2	5 ⁽⁻⁾	[E2]	0.0001783 25	B(E2)(W.u.)=12.4 +25-18 $\alpha=0.0001783$ 25; $\alpha(\text{K})=5.11\times 10^{-5}$ 7; $\alpha(\text{L})=4.71\times 10^{-6}$ 7; $\alpha(\text{M})=6.20\times 10^{-7}$ 9 $\alpha(\text{N})=2.335\times 10^{-8}$ 33; $\alpha(\text{IPF})=0.0001218$ 17	
5784.9		2340 [@]	100	3444.8	6 ⁺				
5792.7	4 ⁺	760.2 [‡] 2	13.6 [‡] 10	5032.5	(3,4) ⁺				
		1139.7 [‡] 2	28.6 [‡] 19	4653.0	(3,4) ⁺				
		1364.0 [‡] 2	96 [‡] 5	4428.7	4 ⁺				
		1728.8 [‡] 5	5.6 [‡] 8	4064.2	5 ⁽⁻⁾				
		2259.2 [‡] 5	7.0 [‡] 8	3533.5	4 ⁽⁻⁾				
		3934.1 [‡] 5	100 [‡] 7	1858.40	4 ⁺				
5834.5		2301 [@]	100	3533.5	4 ⁽⁻⁾				
6257.5?		1069 ^{#a}		5188.4	8 ⁺				
6278.4?		2214 ^{#a}		4064.2	5 ⁽⁻⁾				
7064.0	10 ⁺	1875.6 5	100	5188.4	8 ⁺	E2	0.000294 4	E_γ : could be the 2200 γ from the 9871 level. B(E2)(W.u.)=19 +7-4 $\alpha=0.000294$ 4; $\alpha(\text{K})=3.69\times 10^{-5}$ 5; $\alpha(\text{L})=3.40\times 10^{-6}$ 5; $\alpha(\text{M})=4.47\times 10^{-7}$ 6 $\alpha(\text{N})=1.686\times 10^{-8}$ 24; $\alpha(\text{IPF})=0.0002530$ 35 E_γ : weighted average of 1876 2 from (¹⁰ B,pn γ), 1875.4 3 from (²⁸ Si,2 $\alpha\gamma$), and 1878.2 12 from (¹⁴ N,np γ). Mult.: stretched ($\Delta J=2$) quadrupole or $\Delta J=0$ dipole from angular anisotropy in (⁴⁰ Ca,pn γ) (1994Ca04); $\Delta J=0$ ruled out by γ excitation function from level scheme; M2 ruled out by RUL.	

Adopted Levels, Gammas (continued)

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

E_i (level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult. &	α^\dagger	Comments
7671.2	(9 ⁻)	2022.2 [#] 3	100	5649.0	(7 ⁻)	[E2]	0.000359 5	B(E2)(W.u.)=11 +5-3 $\alpha=0.000359$ 5; $\alpha(\text{K})=3.21\times 10^{-5}$ 4; $\alpha(\text{L})=2.96\times 10^{-6}$ 4; $\alpha(\text{M})=3.89\times 10^{-7}$ 5 $\alpha(\text{N})=1.468\times 10^{-8}$ 21; $\alpha(\text{IPF})=0.000324$ 5
8411.9	12 ⁺	1347.9 [#] 3	100	7064.0	10 ⁺	E2	0.0001192 17	B(E2)(W.u.)=21 +9-5 $\alpha=0.0001192$ 17; $\alpha(\text{K})=7.132\times 10^{-5}$ 99; $\alpha(\text{L})=6.59\times 10^{-6}$ 9; $\alpha(\text{M})=8.67\times 10^{-7}$ 12 $\alpha(\text{N})=3.26\times 10^{-8}$ 5; $\alpha(\text{IPF})=4.03\times 10^{-5}$ 6 Mult.: stretched ($\Delta J=2$) quadrupole or $\Delta J=0$ dipole from angular anisotropy in (⁴⁰ Ca,pn γ) (1994Ca04); $\Delta J=0$ ruled out by $\gamma\gamma(\text{DCO})$ in (²⁸ Si,2 $\alpha\gamma$) (1996Ca38); M2 ruled out by RUL.
8462.6?		2205 ^{#a}		6257.5?				
9871.4	(11 ⁻)	2200.1 [#] 3	100	7671.2	(9 ⁻)	[E2]	0.000442 6	B(E2)(W.u.)=7.6 +26-16 $\alpha=0.000442$ 6; $\alpha(\text{K})=2.76\times 10^{-5}$ 4; $\alpha(\text{L})=2.54\times 10^{-6}$ 4; $\alpha(\text{M})=3.34\times 10^{-7}$ 5 $\alpha(\text{N})=1.262\times 10^{-8}$ 18; $\alpha(\text{IPF})=0.000411$ 6
10280.9	14 ⁺	1868.9 [#] 3	100	8411.9	12 ⁺	E2	0.000291 4	B(E2)(W.u.)=8.0 +20-13 $\alpha=0.000291$ 4; $\alpha(\text{K})=3.72\times 10^{-5}$ 5; $\alpha(\text{L})=3.42\times 10^{-6}$ 5; $\alpha(\text{M})=4.50\times 10^{-7}$ 6 $\alpha(\text{N})=1.698\times 10^{-8}$ 24; $\alpha(\text{IPF})=0.0002498$ 35 Mult.: Q from $\gamma\gamma(\text{DCO})$ in (²⁸ Si,2 $\alpha\gamma$) (1996Ca38); M2 ruled out by RUL.
11105.6?		2643 ^{#a}		8462.6?				
11648.8	(13 ⁻)	1777.4 [#] 3	100	9871.4	(11 ⁻)	[E2]	0.0002523 35	B(E2)(W.u.)=6.4 +26-15 $\alpha=0.0002523$ 35; $\alpha(\text{K})=4.09\times 10^{-5}$ 6; $\alpha(\text{L})=3.76\times 10^{-6}$ 5; $\alpha(\text{M})=4.95\times 10^{-7}$ 7 $\alpha(\text{N})=1.867\times 10^{-8}$ 26; $\alpha(\text{IPF})=0.0002071$ 29
12301.5?		2430 ^{#a}		9871.4	(11 ⁻)			
13310.0	16 ⁺	3029.0 [#] 3	100	10280.9	14 ⁺	E2	0.000813 11	B(E2)(W.u.)=4.4 +11-8 $\alpha=0.000813$ 11; $\alpha(\text{K})=1.614\times 10^{-5}$ 23; $\alpha(\text{L})=1.482\times 10^{-6}$ 21; $\alpha(\text{M})=1.951\times 10^{-7}$ 27 $\alpha(\text{N})=7.37\times 10^{-9}$ 10; $\alpha(\text{IPF})=0.000796$ 11 Mult.: Q from $\gamma\gamma(\text{DCO})$ in (²⁸ Si,2 $\alpha\gamma$); M2 ruled out by RUL.
15119.0?		3470 ^{#a}		11648.8	(13 ⁻)			
15735.2		5454 [#]		10280.9	14 ⁺			
17342.1?		2223 ^{#a}		15119.0?				
17378.2?		4069 ^{#a}		13310.0	16 ⁺			

† Additional information 1.

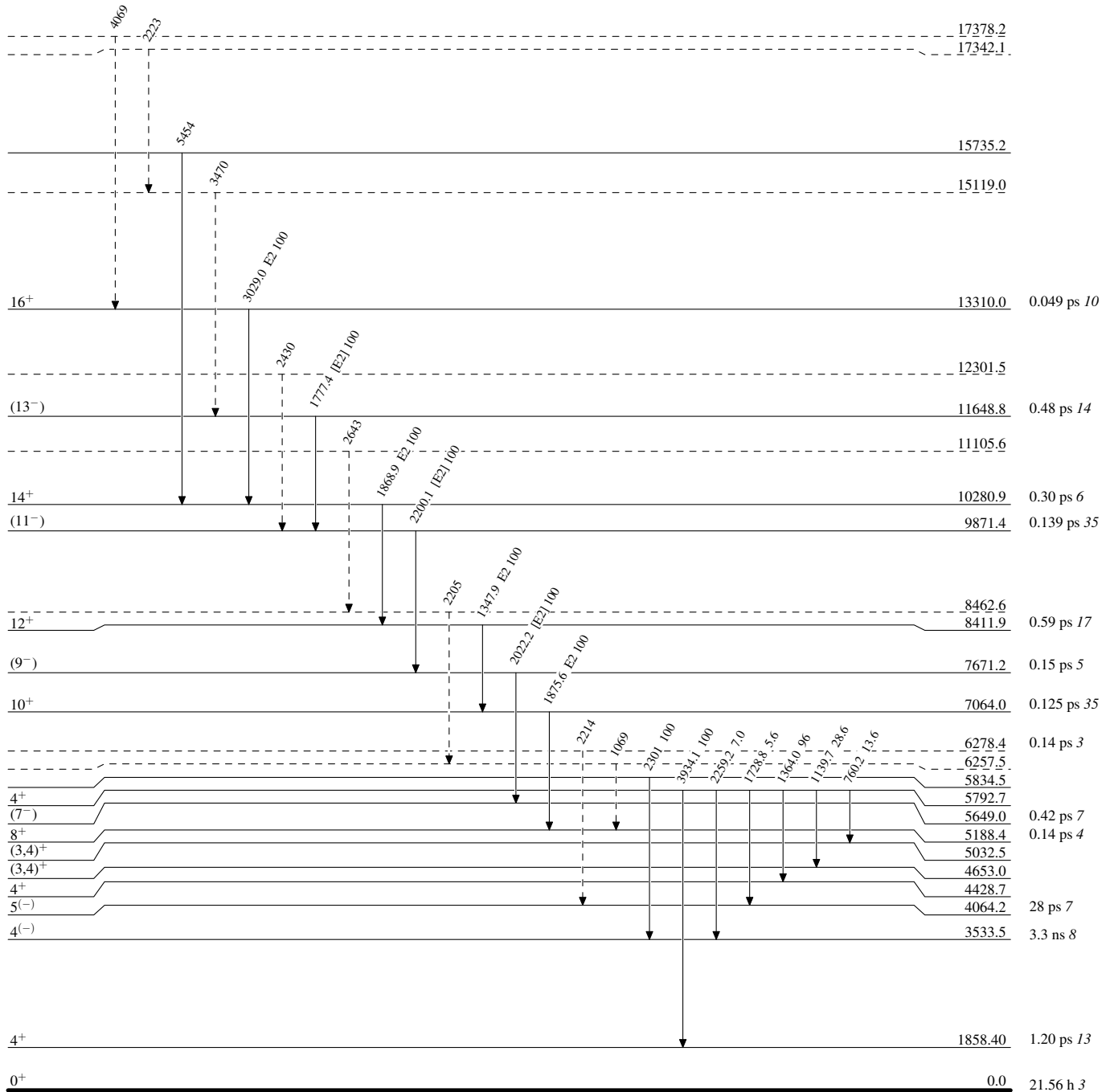
‡ From ⁴⁸Mn β^+ decay.# From (²⁸Si,2 $\alpha\gamma$).@ From (³He,n γ).& From $\gamma(\theta,\text{pol})$ in (¹⁴N,np γ), $\gamma(\theta)$ in (¹⁰B,pn γ) and (¹⁶O,2n γ), unless otherwise noted.^a Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)

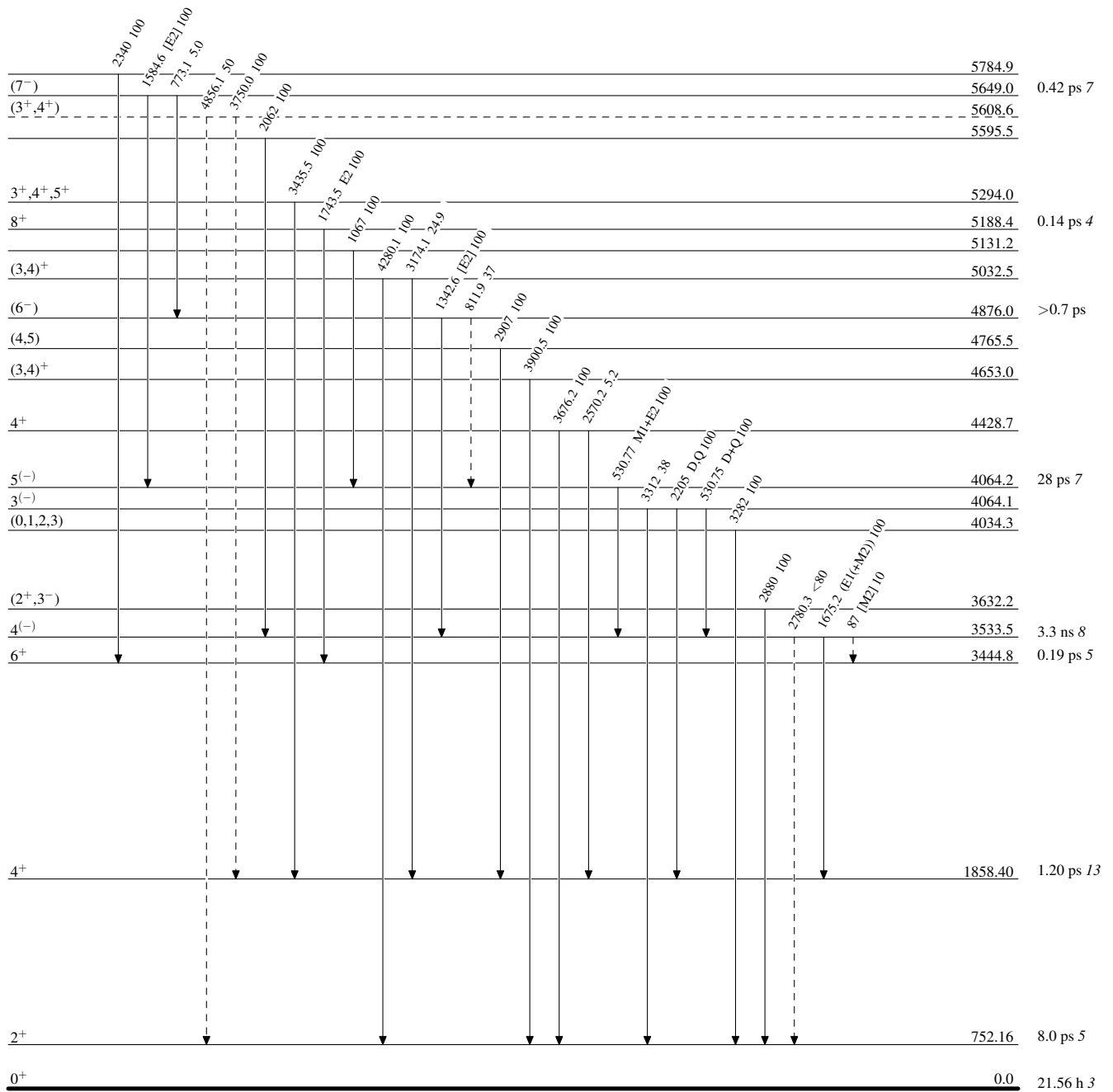
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

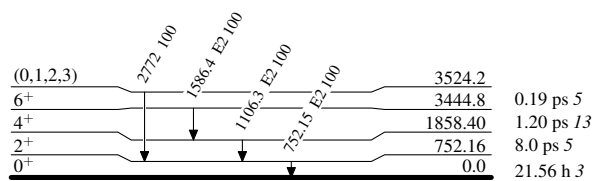
-----▶ γ Decay (Uncertain)

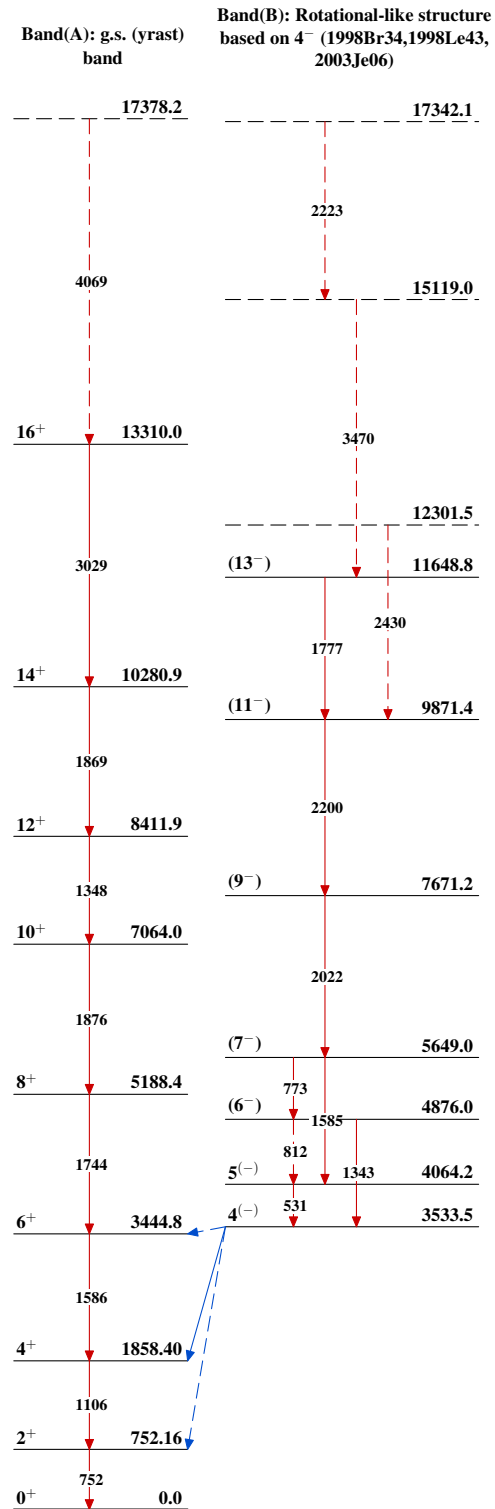


$^{48}_{24}\text{Cr}_{24}$

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

Intensities: Relative photon branching from each level

 ${}^{48}_{24}\text{Cr}_{24}$

Adopted Levels, Gammas $^{48}_{24}\text{Cr}_{24}$