Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	20-Feb-2010

Q(β^-)=−1.65×10^4 *syst*; S(n)=1.803×10^4 *4*; S(p)=4882 *22*; Q(α)=−6794 *20* 2012Wa38
Note: Current evaluation has used the following Q record $ −17100 syst 18.58E350 4883 *26* −6777 *21* 2009AuZZ,2003Au03.
Estimated uncertainty=110 for Q(β^-) (2009AuZZ,2003Au03).
Q(εp)=2243 *20* (2009AuZZ,2003Au03).
Mass excess=−29.472 *20* MeV (1992Bo37).
1972Zi02: identification and production of ^{46}Cr in ^{32}S(^{16}O,2n) reaction.
1991Wi13: ^{46}Ti(π^+,π^-) E=450 MeV, measured cross section for double isobaric analog state using LAMPF facility and Large Acceptance spectrometer (las). Measured dσ/dΩ=0.25 μb/sr 10 at 5°.
1990We05: ^{46}Ti(π^+,π^-) E=33.9 MeV, measured cross section and $\sigma(\theta)$ for double isobaric analog state using LAMPF facility, Measured dσ/dΩ=3.1 μb/sr 8 at 0° and 2.5 μb/sr 6 at 25.1°.
1994Bl10: ^{9}Be(^{58}Ni,X) E=650 MeV/nucleon, Fragment separator FRS at GSI facility, measured cross section for the production of ^{46}Cr.
2005On03: measured half-life of ^{46}Cr g.s.
Structure calculations using shell model: 2008Ma44, 2007He32, 2002Ca48: levels, B(E2), mirror states, etc.

^{46}Cr Levels

Cross Reference (XREF) Flags

A	^{46}Mn ε decay (36.2 ms)
B	^{47}Fe εp decay (21.9 ms)
C	^{12}C(^{36}Ar,2nγ)
D	Coulomb excitation

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	XREF	Comments
0.0[#]	0$^+$	0.26 s *6*	ABCD	%ε+%β^+=100 T$_{1/2}$: from 1972Zi02, timing of β decays. Other: 0.24 s *14* (2005On03) from β(993γ) coin decay curve. Additional information 1.
892.16[#] *10*	2$^+$	5.4 ps *12*	ABCD	J$^\pi$: level is Coulomb excited. T$_{1/2}$: from B(E2)=0.093 *20* (2005Ya26) in Coulomb excitation.
1987.1[#] *3*	(4$^+$)		ABC	
3196.5[@] *6*	(3$^-$)		BC	
3226.9[#] *6*	(6$^+$)		C	
3296 *3*			C	
3494.3 *7*			C	
3593.7[@] *7*	(4$^-$)		C	
3682.2 *16*			C	
3715.8 *9*			C	
3778.1 *12*			C	
3986.7[@] *7*	(5$^-$)		C	
4235 *3*			C	
4305.5 *12*			C	
4434.4 *10*			C	
4817.4[#] *8*	(8$^+$)		C	
4830[@] *3*	(6$^-$)		C	
5117 *4*			C	
5346[@] *3*	(7$^-$)		C	

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Adopted Levels, Gammas (continued)

^{46}Cr Levels (continued)

E(level)†	J$^{\pi}$‡	XREF	Comments
6179.5# *11*	(10$^+$)	C	
8162.5?# *15*	(12$^+$)	C	
9152 *24*	(4$^+$)	A	T=2 E(level): from 2007Do17, see detailed comment in ^{46}Mn ε decay. J$^{\pi}$: T=2 quadruplet in ^{46}Sc (g.s.,4$^+$), ^{46}Ti (9168,4$^+$,probable IAS of ^{46}Sc g.s.), ^{46}Cr (9152 state) and ^{46}Mn (g.s.). Superallowed type β^+ decay (log $ft\approx$3.4) from ^{46}Mn g.s. to the 9152 level of ^{46}Cr is consistent with this interpretation. Also mirror analogy with 9168, 4$^+$ state of ^{46}Ti. This state decays mainly by proton emission, but only 17.3% *12* branch is so far accounted in measurements of 2007Do17 and 1992Bo37. Energetically, two-proton and α-decay modes are also possible but these are expected to be small (2007Do17).

† From least-squares fit to Eγ's.
‡ As proposed in 2007Ga03 based on $\gamma(\theta)$ data for selected transitions observed in ^{12}C(^{36}Ar,2nγ) and mirror analogy with ^{46}Ti and ^{46}V.
# Band(A): Yrast (T=1) band. Structure is similar to T=1 states in mirror nuclide ^{46}Ti and ^{46}V.
@ Band(B): ΔJ=1 band based on (3$^-$).

γ(^{46}Cr)

E$_i$(level)	J$^{\pi}_i$	E$_{\gamma}$†	I$_{\gamma}$	E$_f$	J$^{\pi}_f$	Mult.	Comments
892.16	2$^+$	892.15‡ *10*	100	0.0	0$^+$	[E2]	B(E2)(W.u.)=19 *4*
1987.1	(4$^+$)	1094.9‡ *3*	100	892.16	2$^+$		
3196.5	(3$^-$)	2304.6 *7*	100	892.16	2$^+$	D#	
3226.9	(6$^+$)	1239.9 *5*	100	1987.1	(4$^+$)	Q#	
3296		2404 *3*	100	892.16	2$^+$		
3494.3		1506.9 *8*	100	1987.1	(4$^+$)		
3593.7	(4$^-$)	397.4 *6*	100 *13*	3196.5	(3$^-$)	D#	
		1605.3 *15*	75 *19*	1987.1	(4$^+$)		
3682.2		1695.0 *15*	100	1987.1	(4$^+$)		
3715.8		519.3 *6*	100	3196.5	(3$^-$)		
3778.1		581.7 *11*	50 *30*	3196.5	(3$^-$)		
		1790 *3*	100 *60*	1987.1	(4$^+$)		
3986.7	(5$^-$)	393.0 *15*	12 *7*	3593.7	(4$^-$)		
		492.3 *7*	60 *11*	3494.3			
		760.3 *10*	43 *13*	3226.9	(6$^+$)		
		790.1 *8*	100 *22*	3196.5	(3$^-$)	Q#	
4235		2248 *3*	100	1987.1	(4$^+$)		
4305.5		711.8 *9*	100	3593.7	(4$^-$)		
4434.4		841.0 *22*	22 *13*	3593.7	(4$^-$)		
		1207.4 *9*	100 *17*	3226.9	(6$^+$)		
4817.4	(8$^+$)	1590.4 *6*	100	3226.9	(6$^+$)		
4830	(6$^-$)	1236 *3*	100	3593.7	(4$^-$)		
5117		1401 *3*	100	3715.8			
5346	(7$^-$)	1359 *3*	100	3986.7	(5$^-$)		
6179.5	(10$^+$)	1362.1 *7*	100	4817.4	(8$^+$)		
8162.5?	(12$^+$)	1983.0@ *10*	100	6179.5	(10$^+$)		

† From ^{12}C(^{36}Ar,2nγ), unless otherwise stated.

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Adopted Levels, Gammas (continued)

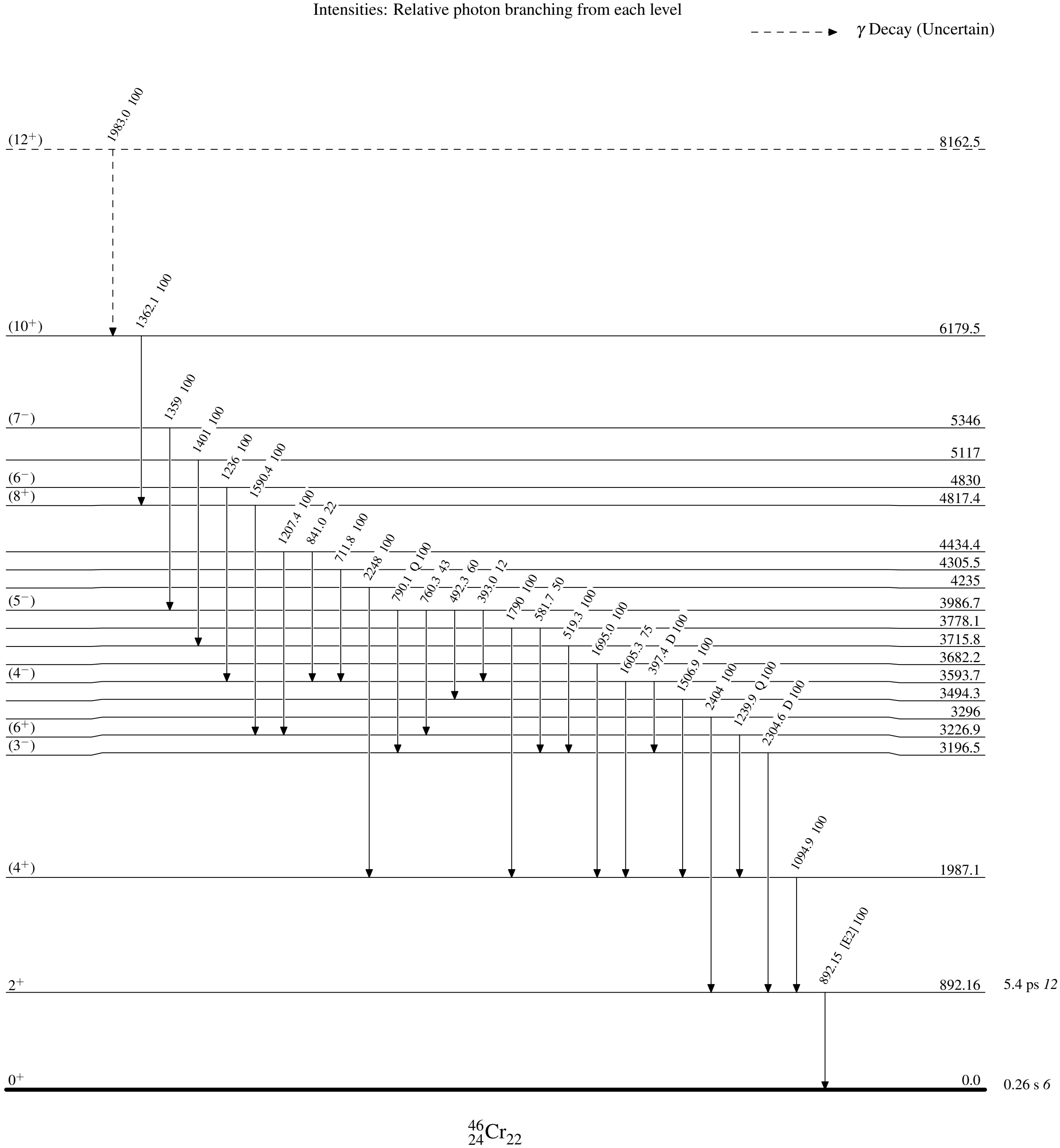
$\gamma(^{46}Cr)$ (continued)

‡ Weighted average of values from ε decay, εp decay and $^{12}C(^{36}Ar,2n\gamma)$.
# The $\gamma(\theta)$ patterns in $^{12}C(^{36}Ar,2n\gamma)$ are consistent with $\Delta J=2$, quadrupole for 1240γ and 790γ; and $\Delta J=1$ for 2305γ and 397γ.
@ Placement of transition in the level scheme is uncertain.

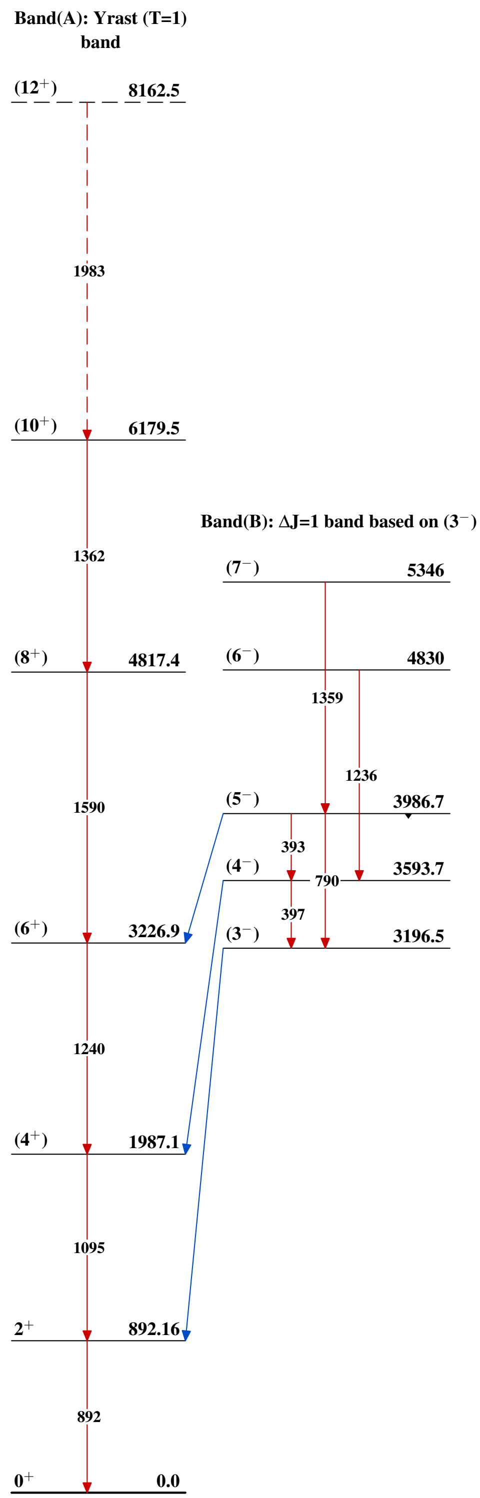
Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{46}_{24}Cr_{22}$

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 (^{24}Mg(^{24}Mg,^{24}Mg) and ^{24}Mg(^{24}Mg,^{24}Mg′)), 1987Sa05 (^{24}Mg(^{24}Mg,^{20}Ne), ^{24}Mg(^{24}Mg,^{24}Mg), and ^{24}Mg(^{24}Mg,^{24}Mg′)), 1987Wu01 (^{24}Mg(^{24}Mg,^{24}Mg′)), 1990Wu03 ((^{24}Mg,^{24}Mg), (^{24}Mg,^{24}Mg′), (^{24}Mg,x)), 1993LeZY (^{24}Mg(^{24}Mg,X)), and 1994Ha03 ((^{24}Mg,^{24}Mg′) and (^{24}Mg,^{20}Ne)) 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.

^{48}Cr Levels

1994Ca04 in (^{40}Ca,npγ) 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,nγ)
B	^{49}Fe β^+p decay	F	^{34}S(^{16}O,2nγ)	J	^{48}Ti(π^+,π^-)
C	^{10}B(^{40}Ca,pnγ),^{40}Ca(^{10}B,pnγ)	G	^{36}Ar(^{14}N,npγ)	K	^{50}Cr(p,t)
D	^{24}Mg(^{32}S,2$\alpha\gamma$),(^{32}S,^{8}Beγ)	H	^{46}Ti(^{3}He,n)		

E(level)[†]	J$^\pi$	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$^\pi$: L(p,t)=2 from 0$^+$; 752.15γ 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,pnγ), using RDM. Other: 11.6 ps *15* from RDM in 1975Ha04 in (^{16}O,2nγ), 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$^\pi$: L(p,t)=4 from 0$^+$; 1106.3γ 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,npγ), using DSAM. Other: 1.0 ps *+14−4* from RDM in (^{10}B,pnγ), <3.5 ps from RDM in (^{16}O,2nγ).
3420? *20*	(0$^+$)		K	J$^\pi$: L(p,t)=(0) from 0$^+$.
3444.8[&] *4*	6$^+$	0.19 ps *5*	A CDE G I K	J$^\pi$: 1586.4γ E2 to 4$^+$; spin>4 from γ excitation function in (^{10}B,pnγ) (1979Ha45); band assignment. T$_{1/2}$: other: <0.7 ps from DSAM in (^{14}N,npγ) (1979Ek03).
3524.2 *10*	(0,1,2,3)		I k	XREF: k(3527). J$^\pi$: <4 from γ-ray excitation functions in (^{3}He,nγ) (2003Je06).
3533.5[a] *3*	4$^{(-)}$[@]	3.3 ns *8*	A C EFG I k	XREF: k(3527). J$^\pi$: spin=4 from γ excitation function and $\gamma\gamma(\theta)$ in (^{3}He,nγ) (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,npγ) and 1975Ha04 (assigning 6$^+$) and 1979Ha45 (assigning 6$^-$) in (^{16}O,2nγ),

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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 ΔJ=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 1675γ(t) in (^{10}B,pnγ) (1979Ha45) and 2.5 ns *7* from RDM in (^{14}N,npγ) (1979Ek03).
3632.2 *10*	(2^+,3^-)		I K	J^π: (<4) from γ excitation functions in (^{3}He,nγ) (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}He,nγ) (2003Je06).
4064.1 *4*	$3^{(-)}$		I k	$T_{1/2}$: from (^{10}B,pnγ). J^π: ≤3 from γ excitation functions and ≥3 from γγ(θ) in (^{3}He,nγ) and π=− 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 γγ(θ) in (^{3}He,nγ) (2003Je06); 530.77γ 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}B,pnγ) (1979Ek03).
4280 *5*	(0^+)		K	J^π: L(p,t)=(0) from 0^+.
4428.7 *3*	4^+		A K	XREF: K(4432). J^π: L(p,t)=4 from 0^+; allowed β feeding (log *ft*=4.6) from 4^+ parent.
4640 *10*	2^+		K	J^π: L(p,t)=2 from 0^+.
4653.0 *3*	$(3,4)^+$		A	J^π: 3900.5γ to 2^+; allowed β feeding (log *ft*=5.0) from 4^+ parent.
4765.5 *11*	(4,5)		I	J^π: from γ excitation functions in (^{3}He,nγ) (2003Je06).
4876.0[a] *4*	(6^-)	>0.7 ps	C E I	XREF: C(?). J^π: (5,6) from γ excitation functions in (^{3}He,nγ) (2003Je06); 6^- from shell-model prediction (1998Br34).
5032.5 *3*	$(3,4)^+$		A	J^π: 4280.1γ 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 γγ(DCO) in (^{28}Si,2αγ) (1996Ca38); 1743.5γ E2 to 6^+; band assignment. $T_{1/2}$: other: <0.8 ps from (^{14}N,npγ) (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}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 4856.1γ 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^+)		K	J^π: L(p,t)=(0) from 0^+.
5784.9 *11*			I	
5792.7 *3*	4^+		A K	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^+		K	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}Si,2αγ); 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}Si,2αγ) 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}Si,2αγ) (1996Ca38).
6420 *10*	(5^-)		K	J^π: L(p,t)=(5) from 0^+.

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Adopted Levels, Gammas (continued)

^{48}Cr 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 $\gamma\gamma$(DCO) in (^{28}Si,2$\alpha\gamma$) (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,2$\alpha\gamma$); 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 (^{28}Si,2$\alpha\gamma$) (1998Br34), unless otherwise noted.

[@] ^{48}Cr is a well-deformed nucleus with $\beta\approx$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 $\Delta\pi$=−. $T_{1/2}$(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 ^{46}Ti(^{3}He,nγ). See additional arguments by 1998Br34 in (^{28}Si,2$\alpha\gamma$) supporting J^π(3533)=4^-. Note that Mult(87γ)=D,E2 from comparison to RUL is not consistent with this assignment.

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Adopted Levels, Gammas (continued)

^{48}Cr Levels (continued)

[&] Band(A): g.s. (yrast) band. 1994Ca04 in (^{40}Ca,npγ) 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)

$\gamma(^{48}Cr)$

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.[&]	δ[&]	α[†]	Comments
752.16	2^+	752.15 *13*	100	0.0	0^+	E2		0.000325 *5*	B(E2)(W.u.)=28.4 *+19−17* α=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,2$\alpha\gamma$), 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=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,2$\alpha\gamma$), 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 $\gamma(\theta)$ 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=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.
		1675.2 *3*	100 *7*	1858.40	4^+	(E1(+M2))	−0.01 *5*	0.000427 *6*	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 $\gamma\gamma(\theta)$ in (^{3}He,nγ); $\Delta\pi$=(yes) from level scheme.

$^{48}_{24}Cr_{24}$-5

Adopted Levels, Gammas (continued)

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

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.[&]	δ[&]	α[†]	Comments
3533.5	$4^{(-)}$	2780.3[a]	<80	752.16	2^+				E_γ,I_γ: from (^{10}B,pnγ) (1973Ku10); not observed in (^{3}He,nγ).
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 *+28−61*		E_γ: weighted average of 530.8 *3* from (^{10}B,pnγ), 531.0 *3* from (^{28}Si,2$\alpha\gamma$), 530.6 *2* from (^{16}O,2nγ), and 530.77 *17* from (^{14}N,npγ).
		2205[@]	100[@] *8*	1858.40	4^+	D,Q			Mult.: from $\gamma\gamma(\theta)$ in (^{3}He,nγ), with δ(Q/D)=−0.05 *5* or ≥10 (2003Je06).
		3312[@]	38[@] *4*	752.16	2^+				
4064.2	$5^{(-)}$	530.77 *17*	100	3533.5	$4^{(-)}$	M1+E2	0.24 *3*	0.000477 *9*	B(M1)(W.u.)=0.0050 *+17−10*; B(E2)(W.u.)=2.5 *+11−7* α=0.000477 *9*; α(K)=0.000431 *8*; α(L)=4.01×10^{-5} *8*; α(M)=5.27×10^{-6} *10* α(N)=1.98×10^{-7} *4* E_γ: from (^{14}N,npγ). Others: 531.0 *5* from ^{48}Mn β^+ decay, 530.8 *3* from (^{10}B,pnγ), 531.0 *3* from (^{28}Si,2$\alpha\gamma$), and 530.6 *2* from (^{16}O,2nγ). Mult.,δ: D+Q from $\gamma(\theta)$ in (^{10}B,pnγ), with δ(Q/D) deduced by the evaluator from 5.5% *15-10* E2 component in 1979Ha45; M2 ruled out by RUL. Others: δ(Q/D)=−0.36 *+28−61* from $\gamma(\theta)$ in (^{16}O,2nγ) (1975Ha04), +0.01 *5* or >7 from $\gamma\gamma(\theta)$ in (^{3}He,nγ) (2003Je06), >20 for J^π=6$^-$ from $\gamma(\theta)$ in (^{14}N,npγ) (1979Ek03).
4428.7	4^+	2570.2[‡] *5*	5.2[‡] *6*	1858.40	4^+				
		3676.2[‡] *4*	100[‡] *6*	752.16	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*	α=0.00022 *4*; α(K)=0.00020 *4*; α(L)=1.9×10^{-5} *4*; α(M)=2.5×10^{-6} *5*; α(N+..)=9.3×10^{-8} *17* α(N)=9.3×10^{-8} *17*
		1342.6[#] *3*	100[#] *17*	3533.5	$4^{(-)}$	[E2]		0.0001185 *17*	B(E2)(W.u.)<14 α=0.0001185 *17*; α(K)=7.19×10^{-5} *10*; α(L)=6.64×10^{-6} *9*; α(M)=8.74×10^{-7} *12* α(N)=3.28×10^{-8} *5*; α(IPF)=3.90×10^{-5} *6* E_γ: other: 1343 *3* from (^{10}B,pnγ).
5032.5	$(3,4)^+$	3174.1[‡] *5*	24.9[‡] *34*	1858.40	4^+				
		4280.1[‡] *5*	100[‡] *6*	752.16	2^+				
5131.2		1067[@]	100	4064.2	$5^{(-)}$				

$^{48}_{24}Cr_{24}$-6

Adopted Levels, Gammas (continued)

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

E_i(level)	J^{π}_i	E_γ	I_γ	E_f	J^{π}_f	Mult.[&]	α[†]	Comments
5188.4	8^+	1743.5 *3*	100	3444.8	6^+	E2	0.0002385 *33*	B(E2)(W.u.)=24 *+10−6* α=0.0002385 *33*; α(K)=4.24×10^{-5} *6*; α(L)=3.91×10^{-6} *5*; α(M)=5.14×10^{-7} *7* α(N)=1.937×10^{-8} *27*; α(IPF)=0.0001917 *27* E_γ: weighted average of 1742.5 *10* from (^{10}B,pnγ), 1743.4 *3* from (^{28}Si,2$\alpha\gamma$), and 1744.0 *5* from (^{14}N,npγ). Mult.: from $\gamma(\theta$,pol) in (^{14}N,npγ) (1979Ek03), and γ anisotropy (ΔJ=0 or 2) in (^{40}Ca,pnγ) (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*	α=0.00025 *5*; α(K)=0.00023 *5*; α(L)=2.1×10^{-5} *5*; α(M)=2.8×10^{-6} *6*; α(N+..)=1.04×10^{-7} *20* α(N)=1.04×10^{-7} *20*
		1584.6[#] *3*	100[#] *10*	4064.2	$5^{(-)}$	[E2]	0.0001783 *25*	B(E2)(W.u.)=12.4 *+25−18* α=0.0001783 *25*; α(K)=5.11×10^{-5} *7*; α(L)=4.71×10^{-6} *7*; α(M)=6.20×10^{-7} *9* α(N)=2.335×10^{-8} *33*; α(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	$5^{(-)}$			E_γ: could be the 2200γ from the 9871 level.
7064.0	10^+	1875.6 *5*	100	5188.4	8^+	E2	0.000294 *4*	B(E2)(W.u.)=19 *+7−4* α=0.000294 *4*; α(K)=3.69×10^{-5} *5*; α(L)=3.40×10^{-6} *5*; α(M)=4.47×10^{-7} *6* α(N)=1.686×10^{-8} *24*; α(IPF)=0.0002530 *35* E_γ: weighted average of 1876 *2* from (^{10}B,pnγ), 1875.4 *3* from (^{28}Si,2$\alpha\gamma$), and 1878.2 *12* from (^{14}N,npγ). Mult.: stretched (ΔJ=2) quadrupole or ΔJ=0 dipole from angular anisotropy in (^{40}Ca,pnγ) (1994Ca04); ΔJ=0 ruled out by γ excitation function from level scheme; M2 ruled out by RUL.

$^{48}_{24}Cr_{24}$-7

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

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[&]	α[†]	Comments
7671.2	(9^-)	2022.2[#] *3*	100	5649.0	(7^-)	[E2]	0.000359 *5*	B(E2)(W.u.)=11 *+5−3* α=0.000359 *5*; α(K)=3.21×10^{-5} *4*; α(L)=2.96×10^{-6} *4*; α(M)=3.89×10^{-7} *5* α(N)=1.468×10^{-8} *21*; α(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* α=0.0001192 *17*; α(K)=7.132×10^{-5} *99*; α(L)=6.59×10^{-6} *9*; α(M)=8.67×10^{-7} *12* α(N)=3.26×10^{-8} *5*; α(IPF)=4.03×10^{-5} *6* Mult.: stretched (ΔJ=2) quadrupole or ΔJ=0 dipole from angular anisotropy in (^{40}Ca,pnγ) (1994Ca04); ΔJ=0 ruled out by $\gamma\gamma$(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* α=0.000442 *6*; α(K)=2.76×10^{-5} *4*; α(L)=2.54×10^{-6} *4*; α(M)=3.34×10^{-7} *5* α(N)=1.262×10^{-8} *18*; α(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* α=0.000291 *4*; α(K)=3.72×10^{-5} *5*; α(L)=3.42×10^{-6} *5*; α(M)=4.50×10^{-7} *6* α(N)=1.698×10^{-8} *24*; α(IPF)=0.0002498 *35* Mult.: Q from $\gamma\gamma$(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* α=0.0002523 *35*; α(K)=4.09×10^{-5} *6*; α(L)=3.76×10^{-6} *5*; α(M)=4.95×10^{-7} *7* α(N)=1.867×10^{-8} *26*; α(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* α=0.000813 *11*; α(K)=1.614×10^{-5} *23*; α(L)=1.482×10^{-6} *21*; α(M)=1.951×10^{-7} *27* α(N)=7.37×10^{-9} *10*; α(IPF)=0.000796 *11* Mult.: Q from $\gamma\gamma$(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^+			

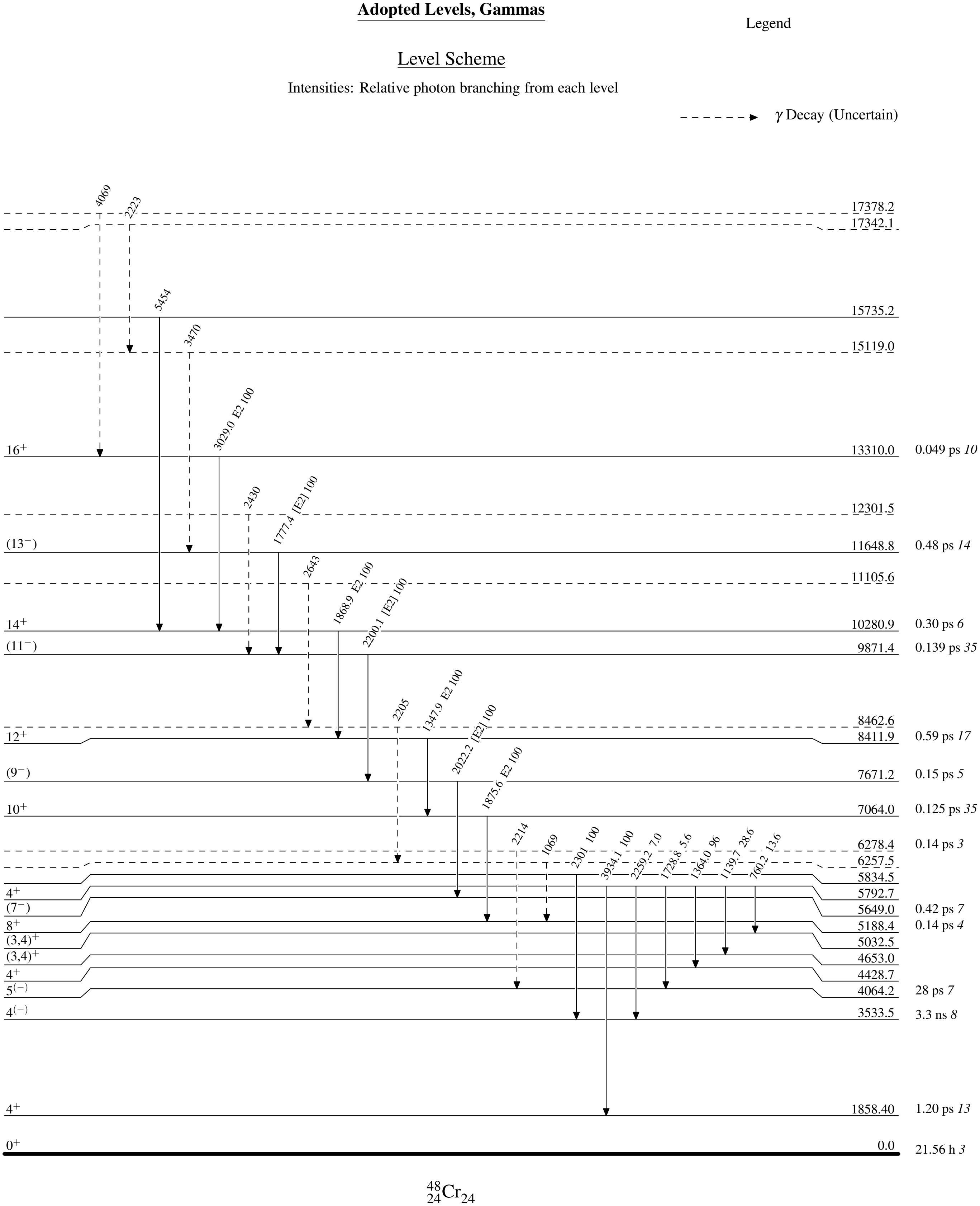
† Additional information 1.
‡ From ^{48}Mn β^+ decay.
\# From (^{28}Si,2$\alpha\gamma$).
@ From (^{3}He,nγ).
& From $\gamma(\theta$,pol) in (^{14}N,npγ), $\gamma(\theta)$ in (^{10}B,pnγ) and (^{16}O,2nγ), unless otherwise noted.
a Placement of transition in the level scheme is uncertain.

$^{48}_{24}Cr_{24}$-8

Adopted Levels, Gammas

Level Scheme

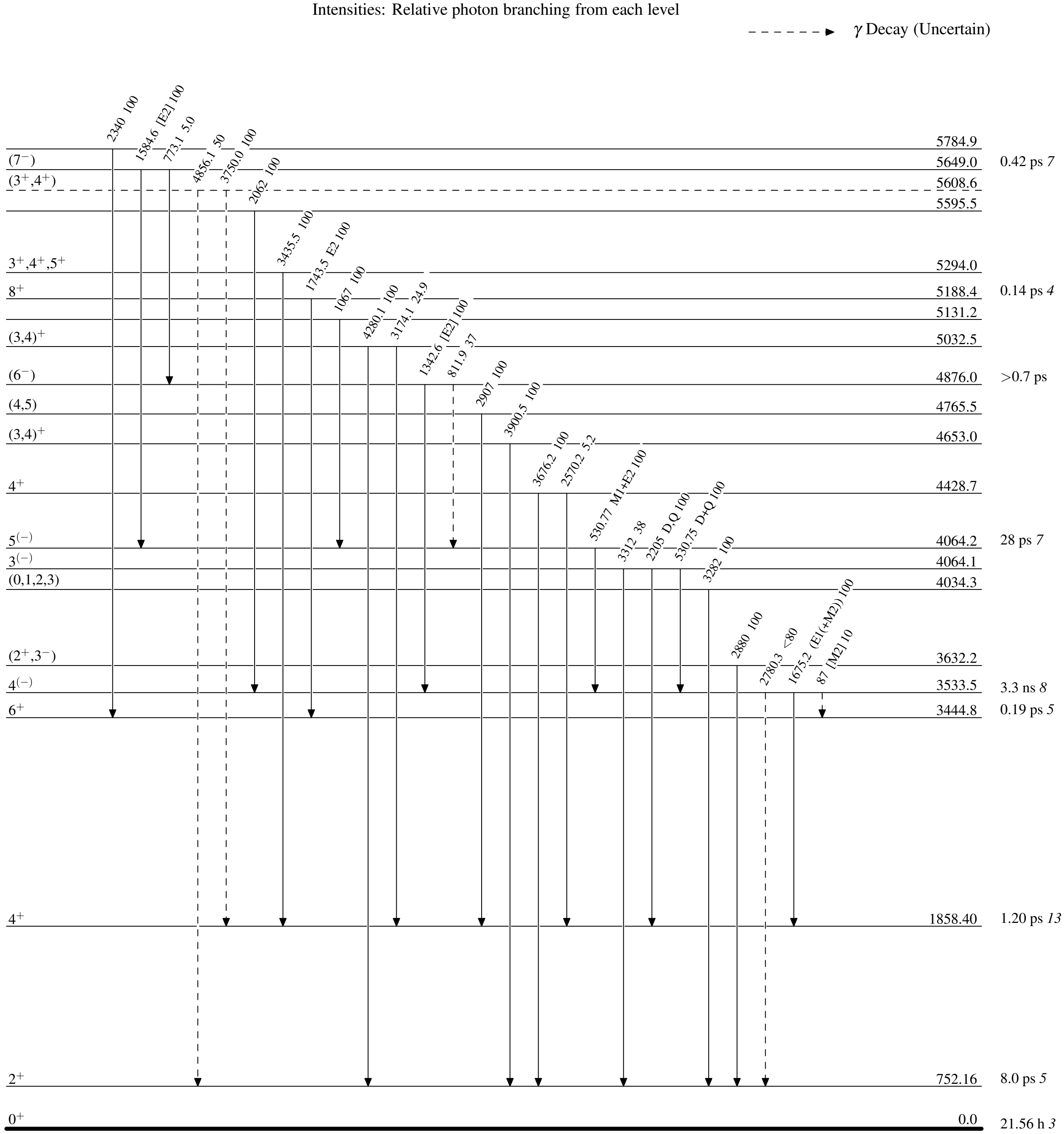
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

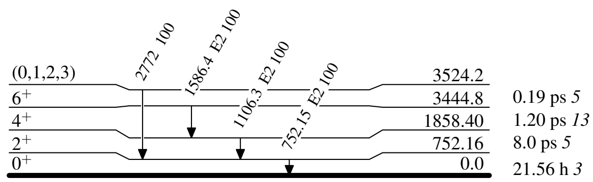


$^{48}_{24}Cr_{24}$

Adopted Levels, Gammas

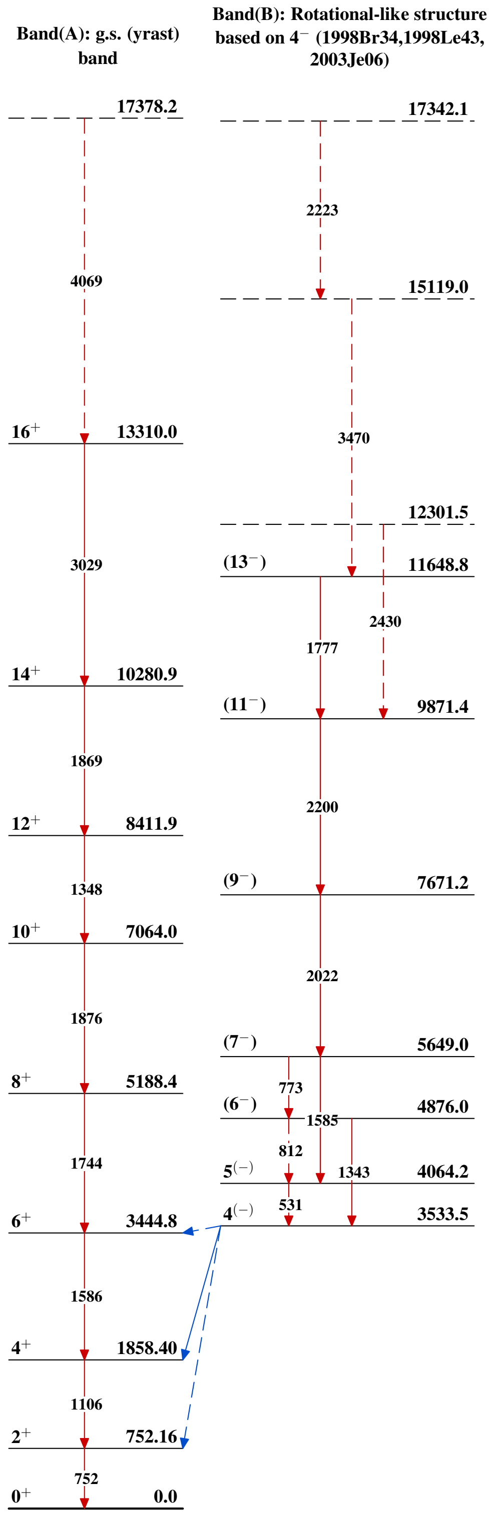
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{48}_{24}Cr_{24}$

Adopted Levels, Gammas



$^{48}_{24}Cr_{24}$

Adopted Levels, Gammas

History

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

Q(β^-)=−7634.48 *7*; S(n)=13000.3 *22*; S(p)=9589.1 *9*; Q(α)=−8559.2 *5* 2017Wa10

S(2n)=23583 *7*, S(2p)=16347.3 *4* (2017Wa10).

See 1994Wi05, 1993Wi21, 1990Ha13 and 1984KoZH for Q(ε)(^{50}Mn) obtained for studies of super-allowed β decay. These values include atomic corrections.

Other reactions:

1991Wi13: ^{50}Ti(π^+,π^-), E=450 MeV, measured σ(θ=5°) at LAMPF using Large Acceptance Spectrometer, deduced mass dependence for cross sections for the double-isobaric-analog state.

1973De29: ^{50}Cr(γ,n), E=20.43-22.22 MeV, measured σ by activation. Monochromatic γ rays from H(p,γ); FWHM=122 keV. Related results to the width of dipole state in ^{50}Cr.

Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for 142 primary references dealing with various aspects of nuclear structure.

Added in proofs: PRC accepted paper (April 9, 2019) by M.M. Giles et al used in the present evaluation, is now published as Phys. Rev. C 99, 044317 (2019).

^{50}Cr Levels

Isospin (T) From ^{52}Cr(p,t).

Cross Reference (XREF) Flags

A	^{50}V β^- decay (2.65×10^{17} y):?	H	^{48}Ti(^{16}O,^{14}C)	O	^{50}Cr(d,d′)
B	^{50}Mn ε decay (283.19 ms)	I	^{50}V(p,nγ)	P	^{50}Cr(^{3}He,^{3}He′)
C	^{50}Mn ε decay (1.75 min)	J	^{50}Cr(γ,γ′),(pol γ,γ′)	Q	^{50}Cr(α,α′)
D	^{24}Mg(^{32}S,α2pγ)	K	^{50}Cr(e,e′)	R	^{50}Cr(α,α′γ)
E	^{28}Si(^{28}Si,α2pγ)	L	^{50}Cr(n,n′γ)	S	^{52}Cr(p,t)
F	^{40}Ca(^{16}O,α2pγ),(^{12}C,2pγ)	M	^{50}Cr(p,p′)	T	^{54}Fe(p,pα)
G	^{48}Ti(^{3}He,n)	N	^{50}Cr(p,p′γ)	U	Coulomb excitation

E(level)[†]	J$^\pi$[#]	T$_{1/2}$[&]	XREF	Comments
0.0[b]	0$^+$	>1.3×10^{18} y	ABCDEFGHIJKLMNOPQRSTU	%2ε=? T=1 XREF: A(?). T$_{1/2}$: from search for double beta decay by 2003Bi05 and 1985No03 who measured $\gamma^\pm$ (HPGe) and deduced a lower limit on T$_{1/2}$ for 0ν and 2ν modes: >1.8×10^{17} y (1985No03), >1.3×10^{18} y (2003Bi05). Other: 1952Fr23. Evaluated rms charge radius: <r^2>$^{1/2}$=3.6588 fm *65* (2013An02). Evaluated δ<r^2>(^{50}Cr,^{52}Cr)=0.099 fm^2 *37* (2013An02).
783.31[b] *10*	2$^+$	9.08 ps *28*	ABCDEFGHIJKLMNOPQRSTU	μ=+1.24 *6* (2000Er06,2014StZZ) Q=−0.36 *7* (1975To06,2016St14) XREF: A(?). J$^\pi$: E2 783.3γ to 0$^+$. T$_{1/2}$: weighted averaged mean lifetime=13.1 ps *4* deduced from experimental values in different methods: mean lifetime τ=13.3 ps *6* (M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019, RDDS in ^{40}Ca(^{12}C,2pγ)); τ=13.0 ps *4* (2017Ar09, RDDS in ^{27}Al(^{28}Si,αpγ), see

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{50}Cr Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[&]	S	XREF	Comments
					(^{28}Si,α2pγ) dataset); 13.2 ps *4* (2000Er01,2000Er06, DSAM in Coul. ex.); 12.6 ps *21* (1974Br04, RDDS in ^{40}Ca(^{16}O,2p$\alpha\gamma$)); 12.1 ps *12* (1973De09, RDDS in ^{40}Ca(^{12}C,2pγ)); 10 ps *2* (1972Ra14, DSAM in Coul. ex.); and the following mean lifetimes deduced by evaluators from B(E2)↑ measurements in Coulomb excitation: 13.5 ps *7* (B(E2)=0.102 *5* in 1975To06); 12.1 ps *11* (B(E2)=0.115 *10* in 1972Ra14); 15.2 ps *17* (B(E2)=0.092 *14* in 1971DaZM); 12.1 ps *13* (B(E2)=0.115 *12* in 1966Mc18,1961Mc18); 9.6 ps *19* (B(E2)=0.15 *3* in 1960An09); and τ=14.9 ps *8* from B(E2)=0.093 *5* in (e,e′) (1983Li02). Omission of seemingly discrepant values of 9.6 ps *19* from 1960An09 and 15.2 ps *17* from 1971DaZM gives the same weighted average. Value is 9.11 ps *+28−20* in 2016Pr01 evaluation. μ: from transient-magnetic fields (TF) in Coul. ex. (2000Er06). Others: +1.28 *22* (1994Pa34, TF in (^{40}Ca,2pγ)); +0.9 *3* (1987Pa28, TF in Coul. ex.); +1.2 *2* (ion implantation PAC, 1977Fa07). Q: reorientation method in Coul. ex. (1975To06).
1881.42[b] *19*	4$^+$	2.20 ps *33*		CDEF HI KLMNOPQRS U	μ=+3.1 *5* (2000Er06,2014StZZ) B(E4)↑=0.000451 (1983Li02) B(E4) from (e,e′). J^{π}: stretched E2 1098.1γ to 2$^+$; L(p,t)=4. $T_{1/2}$: unweighted average of 3.4 ps *5* (M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019, RDDS in ^{40}Ca(^{12}C,2pγ)); 1.47 ps *16* (2004Br42, DSAM in ^{28}Si(^{28}Si,α2p)); 1.7 ps *5* (1998Br34, DSAM in ^{28}Si(^{28}Si,α2p)); 2.22 ps *49* (2000Er06,2000Er01, DSAM in Coulomb excitation); 2.22 ps *28* (1973De09, RDDS in ^{40}Ca(^{12}C,2pγ)). Other: <2.8 ps (1974Br04, RDDS). Weighted average is 1.80 ps *26* with reduced χ^2=4.4 as compared to critical χ^2=2.4. μ: from transient-magnetic fields (TF) in Coul. ex. (2000Er06). Other: +1.7 *4* (1994Pa34,TF in (^{40}Ca,2pγ)) is in disagreement.
2924.6 *4*	2$^+$	9.4 fs *14*		HI KLMNOPQ S	J^{π}: E2 2924γ to 0$^+$; L(p,t)=2 from 0$^+$. $T_{1/2}$: from DSAM in (p,p′γ).
3161.3 *4*	2$^+$	10.9 fs *16*		k MNOPQ S	XREF: k(3160)M(3156). $T_{1/2}$: from DSAM in (p,p′γ). J^{π}: L(α,α′)=L(p,t)=2 from 0$^+$.
3164.06[b] *25*	6$^+$	0.80 ps *23*		CDEF k N R	μ=+3.2 *10* (1994Pa34,2014StZZ) XREF: k(3160). J^{π}: from $\gamma(\theta$,pol) in (^{16}O,α2pγ); stretched E2 1282.5γ to 4$^+$. $T_{1/2}$: weighted average of 0.69 ps *14* from DSAM in ^{28}Si(^{28}Si,α2pγ) (1998Br34) and 1.25 ps 28 from RDDS in (^{12}C,2pγ) (1973De09). μ: from g=0.54 *16* (1994Pa34, TF in (^{40}Ca,2pγ)).
3324.56 *22*	4$^+$	97 fs *25*	0.032	C EF K MNOPQ S	J^{π}: L(α,α′)=L(d,d′)=4 from 0$^+$. $T_{1/2}$: from DSAM in (p,p′γ). Other: <0.7 ps from RDM in (^{12}C,2pγ). B(E4)=0.000192 (1983Li02) in (e,e′).

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Adopted Levels, Gammas (continued)

^{50}Cr Levels (continued)

E(level)†	Jπ#	$T_{1/2}$&	XREF	Comments
3594.63 *25*	2+,3,4+	30 fs *5*	h MNOPQ	XREF: h(3600)M(3587). Jπ: 1713.2γ to 4+, 2811.2γ to 2+ can only have mult=D or E2 by RUL. $T_{1/2}$: from DSAM in (p,p′γ).
3611.4 *4*	4+	6 fs *4*	E h MNOPQ S	XREF: h(3600)M(3602). Jπ: L(p,t)=4 from 0+. $T_{1/2}$: from DSAM in (p,p′γ).
3628.9 *5*	1+	0.305 eV *13*	B J MN	Jπ: dipole 3628.7γ to 0+; σ(θ) in (p,p′) (1989Wi13); expected 1+ from shell-model predictions (see 1989Wi13). $T_{1/2}$: from Γ_0=0.205 eV *9* in (γ,γ′). Other: 5 fs *3* in (p,p′γ).
3698.2 *5*	2+	12.8 fs *18*	MNOPQ S	Jπ: L(p,t)=2; M1+E2 2914.8γ to 2+. L(α,α′)=L(p,p′)=L(^{3}He,^{3}He′)=4 for a 3698 *20* level inconsistent, if it is the same level as seen in other reactions. $T_{1/2}$: from DSAM in (p,p′γ).
3792.1 *4*	(5+)	9.0 ps *14*	EF MNO	XREF: M(3786). Jπ: Jπ=5+ from pγ(θ) in (p,p′γ); L(p,p′)=4; and absence of this level in (α,α′). However (4−) cannot be ruled out as proposed by 1998Br34 from γ(θ) in (^{28}Si,α2pγ). $T_{1/2}$: from RDM in (^{16}O,α2pγ). Other: >73 fs from DSAM in (p,p′γ).
3825.7 *3*	(6)+	<0.7 ps	C EF MNOPqRs	XREF: q(3844)s(3832). Jπ: logft=5.0 from 5+; angular distribution of the 661.76 keV γ corresponds to ΔI=0 dipole or stretched quadrupole transition. $T_{1/2}$: inconsistent with 3.5 ps *+35−14* (1973De09) from RDM in (^{12}C,2pγ). Other: <1.4 ps from RDDS in 1974Br04 in (^{16}O,α2pγ).
3844.4 *4*	2+,3,4+	0.22 ps *6*	MNOPq s	XREF: q(3844)s(3832). Jπ: 1962.9γ to 4+ and 683.4γ to 2+ can only have mult=D or E2 by RUL. $T_{1/2}$: from DSAM in (p,p′γ).
3850 *20*	0+		B G	XREF: B(3827). Jπ: L(^{3}He,n)=0.
3875.4 *3*	(4+,5,6+)	0.62 ps *21*	E MNOPQ	XREF: M(3867). Jπ: γs to 4+ and 6+.
3895.4 *10*	0+	24 ps *+14−10*	H MNOPQ S	Jπ: L(p,t)=0. L(α,α′)=L(d,d′)=L(^{3}He,^{3}He′)=4 for 3898 *20* is inconsistent if it is the same level as in other reactions. $T_{1/2}$: from DSAM in (p,p′γ).
3937.3 *4*	2+,3,4+	2.2 fs *10*	MNOPQ S	Jπ: 2055.5γ to 4+ and 3153.7γ to 2+ can only have mult=D or E2 by RUL. $T_{1/2}$: from DSAM in (p,p′γ).
4040	(0+)		N	Jπ: σ(θ) in (p,p′) (1989Wi13).
4051.7 *5*	3−	0.56 ps *11*	MNOPQ S	Jπ: L(α,α′)=L(d,d′)=L(p,p′)=L(^{3}He,^{3}He′)=3 from 0+. $T_{1/2}$: from DSAM in (p,p′γ). B(E3)(from g.s.)=0.0033 *13* (2002Ki06 evaluation) deduced from β_3 in (α,α′) (1990Ba23).
4068.2 *22*	0+	6.5 fs *17*	MN S	E(level): 4068.8 *5* from (p,t). Jπ: L(p,t)=0. $T_{1/2}$: from DSAM in (p,p′γ).
4129.9 *5*	(1,2+)	0.18 ps *6*	H MN	XREF: H(4150).

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Adopted Levels, Gammas (continued)

^{50}Cr Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[&]	XREF	Comments
				J^{π}: 1205.3γ to 2^+; possible 4130γ to 0^+. $T_{1/2}$: from DSAM in (p,p$'\gamma$).
4193.0 *8*	2^+		MNOPQ s	XREF: s(4200). J^{π}: L(α,α')=L(d,d$'$)=L(p,p$'$)=L(^{3}He,^{3}He$'$)=2 from 0^+.
4207 *7*			M s	XREF: s(4200).
4282 *7*			M	
4367.2[c] *4*	5^-	1.39 ps *35*	EF M OPQ S	J^{π}: L(p,t)=L(α,α')=L(p,p$'$)=L(^{3}He,^{3}He$'$)=5 from 0^+.
4523.8 *15*	(4^+)		MN	J^{π}: 1363γ to 6^+ and 3740.5γ to 2^+.
4546.3 *12*	3^-		MNOPQ S	XREF: O(4570)P(4570)Q(4570)S(4540). J^{π}: L(p,t)=L(α,α')=L(p,p$'$)=L(^{3}He,^{3}He$'$)=3 from 0^+.
4653.3 *15*			MN	
4676 *7*	2^+		M OPQ	XREF: O(4680)P(4680)Q(4680). E(level): from (p,p$'$). J^{π}: L(α,α')=L(d,d$'$)=2.
4700	(1^+)		M	J^{π}: from $\sigma(\theta)$ in (p,p$'$) (1989Wi13).
4731 *5*	0^+		G M S	XREF: G(4740). E(level): weighted average of 4728 *7* from (p,p$'$) and 4733 *5* from (p,t). J^{π}: L(p,t)=L(^{3}He,n)=0.
4744.9[b] *4*	8^+	0.28 ps *7*	DEF R	μ=+4.3 *7* (1994Pa34,2014StZZ) J^{π}: ΔJ=2, E2 γ to 6^+; spin=2 from $\gamma(\theta)$ in (^{16}O,α2pγ). μ: g=+0.54 *9* from TF in (^{40}Ca,2pγ) (1994Pa34).
4755 *7*			M	
4766 *5*	2^+		M OPQ S	E(level): weighted average of 4772 *7* from (p,p$'$) and 4763 *5* from (p,t). J^{π}: L(p,t)=L(α,α')=2.
4807 *5*			M S	E(level): weighted average of 4801 *7* from (p,p$'$) and 4810 *5* from (p,t).
4906 *7*			M	
4924 *7*	(4^+)		M opq	XREF: o(4940)p(4940)q(4940). J^{π}: L(α,α')=L(^{3}He,^{3}He$'$)=4 for a level at 4940 *20*.
4961 *7*	(4^+)		M opq	XREF: o(4940)p(4940)q(4940). J^{π}: L(α,α')=L(^{3}He,^{3}He$'$)=4 for a level at 4940 *20*.
4997.1 *4*	$1^{(+)}$	0.140 eV *14*	B J M	J^{π}: log *ft*=5.9 from 0^+; spin=1 from $\gamma(\theta)$ in (γ,γ'). $T_{1/2}$: from Γ_0=0.070 eV *7* in (γ,γ').
5015 *10*			M	
5039 *10*			M s	XREF: s(5040).
5053 *10*			M s	XREF: s(5040).
5078 *10*			M	
5093 *10*			M	
5198 *10*			M	
5207 *10*			M	
5213.4[c] *4*	(6^-)	0.42 ps *7*	E	J^{π}: 846.2γ to 5^- and 1421.1γ to 5^+; band assignment.
5233 *10*	4^+		M OPQ	L: L(α,α')=L(p,p$'$)=L(^{3}He,^{3}He$'$)=4 for a level at 5230 *20*.
5250 *10*			M	
5272 *10*			M	
5297 *10*			M	
5336 *10*			M	
5376 *10*			M	
5429 *10*			M	
5445 *10*			M opq	XREF: o(5450)p(5450)q(5450).
5455 *10*			M opq	XREF: o(5450)p(5450)q(5450).
5548 *10*			M	
5597 *10*			M	
5611 *10*			M	
5623 *10*			M	

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Adopted Levels, Gammas (continued)

^{50}Cr Levels (continued)

E(level)[†]	J$^{\pi}$[#]	$T_{1/2}$[&]	XREF	Comments
5684 *10*			M	
5731 *10*			g M	XREF: g(5710). J$^{\pi}$: L(^{3}He,n)=0 for a level at 5710 gives 0$^+$ for one of the levels at 5731 or 5741.
5741 *10*			g M opq	XREF: g(5710)o(5760)p(5760)q(5760).
5780 *10*			M opq	XREF: o(5760)p(5760)q(5760).
5813 *10*			M	
5835 *10*			M	
5859 *10*			M	
5903 *10*			M	
5931.2 *5*	1$^+$[a]	0.073 eV *6*	J M	
5944 *10*			M	
5957 *10*			M	
5983 *10*	3$^-$		M OPQ	XREF: O(5990)P(5990)Q(5990). J$^{\pi}$: L(α,α')=L(d,d')=L(^{3}He,^{3}He')=3.
5998.0[c] *5*	(7$^-$)	<0.35 ps	E	J$^{\pi}$: 784.6γ to (6$^-$), 1630.9γ to 5$^-$; band assignment. $T_{1/2}$: effective half-life=0.28 ps *7* from DSAM in (^{28}Si,α2pγ).
6003 *10*			M	
6027[‡] *10*			M	
6032 *10*			M	
6071 *10*			M	
6083 *10*			M	
6116[‡] *10*			M	
6123 *10*			M	
6138 *10*			M opq	XREF: o(6150)p(6150)q(6150).
6175 *10*			M	
6202 *10*			M	
6226[‡] *10*			M	
6230 *10*			M	
6243 *10*			M	
6272 *10*			M	
6305 *10*			M	
6330 *10*			M	
6340.6[b] *5*	10$^+$	0.76 ps *14*	DEF R	J$^{\pi}$: ΔJ=2, E2 1595.7γ to 8$^+$; spin=10 from $\gamma(\theta)$ in (^{16}O,α2pγ); band assignment.
6342 *10*			M	
6376 *10*			M	
6450 *20*	3$^-$		M OPQ	J$^{\pi}$: L(α,α')=L(p,p')=L(^{3}He,^{3}He')=L(d,d')=3.
6650 *20*	3$^-$		M OPQ	J$^{\pi}$: L(α,α')=L(d,d')=L(^{3}He,^{3}He')=3.
6754.5 *5*	10$^+$	0.111 ps *21*	DE	J$^{\pi}$: ΔJ=2, E2 2009.6γ to 8$^+$; 414.1γ to 10$^+$; band assignment.
6790 *20*	3$^-$		M OPQ	J$^{\pi}$: L(α,α')=L(d,d')=L(^{3}He,^{3}He')=L(p,p')=3.
6950.6[d] *5*	11$^+$	0.49 ps *4*	DEF	J$^{\pi}$: ΔJ=1, M1 610.2γ to 10$^+$; spin=11 from $\gamma(\theta)$ in (^{16}O,α2pγ); band assignment.
7340	(1$^+$)[@]		M	
7360 *20*	3$^-$		M OPQ	J$^{\pi}$: L(α,α')=L(d,d')=3.
7600.8 *5*	1$^+$[@a]	0.334 eV *37*	J M	XREF: M(7610).
7613.1[d] *5*	12$^+$	0.111 ps *10*	DEF	J$^{\pi}$: ΔJ=1, M1 662.2γ to 11$^+$; spin=12 from $\gamma(\theta)$ in (^{16}O,α2pγ); band assignment.
7645.7 *5*	1$^+$[a]	0.118 eV *14*	J	
7.78×10^3	(1$^+$)[@]		M	
7860 *20*	3$^-$		M OPQ	J$^{\pi}$: L(α,α')=L(d,d')=L(^{3}He,^{3}He')=3.
7948.2 *4*	1$^+$[a]	1.76 eV *10*	J	

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Adopted Levels, Gammas (continued)

^{50}Cr Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[&]	XREF	Comments
7.98×10^3	(1^+)[@]		M	
8045.8 *5*	1^+[a]	0.238 eV *26*	J	
8121.5 *5*	1^+[a]	0.094 eV *11*	J	
8.27×10^3	(1^+)[@]		M	
8360 *50*			G	
8425 *7*	6^+		S	T=2 J^{π}: isobaric analog state from ^{52}Cr(p,t).
8527.6 *4*	1^+[a]	0.85 eV *11*	J	
8638?	(1^+)[@]		M S	XREF: M(8650).
8680 *20*	3^-		G M OPQ	J^{π}: L(α,α')=L(d,d′)=L(^{3}He,^{3}He′)=3.
8748 *6*	4^+		S	T=2 J^{π}: isobaric analog state from ^{52}Cr(p,t).
8813 *6*	2^+		S	T=2 J^{π}: isobaric analog state from ^{52}Cr(p,t).
8885.6 *5*	1^+[a]	0.53 eV *5*	J	
9007.9 *5*	1^+[@a]	0.286 eV *34*	J M	XREF: M(9010).
9208.3 *5*	1^+[@a]	0.37 eV *9*	J M	XREF: M(9190).
9327.1[b] *5*	(12^+)		DE	J^{π}: ΔJ=(2), (Q) 2572.6γ to 10^+ and 1713.8γ to 12^+; band assignment.
9409.5 *5*	1^+[@a]	0.81 eV *13*	J M	XREF: M(9400).
9579.1 *5*	1^+[@a]	0.30 eV *6*	J M	XREF: M(9570).
9642.2[d] *6*	13^+	0.05 ps *2*	DE	J^{π}: ΔJ=2, E2 2692.0γ to 11^+; ΔJ=1, D 2028.9γ to 12^+.
9719.1 *5*	1^+[@a]	1.42 eV *17*	J M	XREF: M(9710).
9900 *50*	2^+		G M	J^{π}: L(^{3}He,n)=2, but 1^+ in (p,p′).
9914.8[d] *6*	14^+	0.22 ps *4*	DE	J^{π}: ΔJ=2, E2 γ to 12^+; ΔJ=1, D γ to 13^+.
10.11×10^3	(1^+)[@]		M	
10.24×10^3	(1^+)[@]		M	
10.38×10^3	(1^+)[@]		M	
10500 *50*	(1^+)[@]		G M	XREF: M(10520). E(level): from ^{48}Ti(^{3}He,n).
10750 *30*	2^+		G	J^{π}: L(^{3}He,n)=2.
10797.5 *6*	$13^{(+)}$	<0.62 ps	DE	J^{π}: ΔJ=1, D γ to 12^+.
10.82×10^3	(1^+)[@]		M	
11013.9 *6*	13^+	0.06 ps *1*	DE	J^{π}: ΔJ=1, D 3400.5γ to 12^+; ΔJ=2, E2 2204.2 from 15^+.
11060 *50*	(1^+)[@]		G M	XREF: M(11020).
11.18×10^3	(1^+)[@]		M	
11.4×10^3 *1*			G	
11530 *50*	0^+		G	J^{π}: L(^{3}He,n)=0.
11660	(1^+)[@]		M	
11680 *20*	0^+		G	E(level): IAS of 3230,$(0)^+$ level in ^{50}V from 1975Bo14 in (^{3}He,n). J^{π}: L(^{3}He,n)=0.
11.82×10^3	(1^+)[@]		M	
11870 *20*	0^+		G	J^{π}: L(^{3}He,n)=0. E(level): IAS of 3462,$(0)^+$ level in ^{50}V from 1975Bo14 in (^{3}He,n).
12.30×10^3	(1^+)[@]		M	E(level): multiplet.
12391.5 *6*	$15^{(+)}$		DE	J^{π}: ΔJ=1, D 2476.9γ to 14^+.
12542.0 *7*	(14^+)		DE	J^{π}: 4927.9γ to 12^+; 2492.1γ from 16^+.

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Adopted Levels, Gammas (continued)

^{50}Cr Levels (continued)

E(level)[†]	J^{π}[#]	$T_{1/2}$[&]	XREF	Comments
12680 *50*			G	
12790 *50*			G	
12950 *50*			G	
13218.4[d] *6*	15^+	0.021 ps *+7−4*	DE	J^{π}: ΔJ=2, E2 3578.7γ to 13^+; ΔJ=1, D 3304.8γ to 14^+.
13222 *6*	0^+		G S	T=3 XREF: S(13220). E(level): from ^{52}Cr(p,t); IAS of 4815,(0)$^+$ level in ^{50}V from 1975Bo14 in (^{3}He,n). J^{π}: L(^{3}He,n)=0.
13495.3 *21*			E	
13641.0 *6*	$14^{(+)}$		D	J^{π}: ΔJ=1, D 2627.1γ to $13^{(+)}$.
13900 *20*	0^+		G	J^{π}: L(^{3}He,n)=0.
13920.8 *12*	$15^{(+)}$	<0.076 ps	DE	J^{π}: ΔJ=1, D 4005.8γ to 14^+.
14500 *30*			G	
14570 *30*			G	
14900 *20*	0^+		G	J^{π}: L(^{3}He,n)=0.
15034.2[d] *7*	16^+	<0.021 ps	DE	J^{π}: ΔJ=2, E2 5121γ to 14^+.
15809.0 *6*	16^+	<0.05 ps	DE	J^{π}: ΔJ=2, E2 2168.1γ to 14^+.
16049.4 *7*	$17^{(+)}$		D	J^{π}: ΔJ=2, Q 2830.9γ to 15^+.
17669.2 *16*	(16,17)		D	J^{π}: 3748.2γ to $15^{(+)}$.
17790.0 *12*	(16,17)		D	J^{π}: 5398.2γ to $15^{(+)}$.
17956.6[d] *10*	18^+	<0.07 ps	DE	J^{π}: ΔJ=2, E2 2922.3γ to 16^+.

[†] From a least-squares fit to γ-ray energies for levels connected by γ transitions, unless otherwise noted.
[‡] Unresolved doublet; spacing <5 keV.
[#] From ^{24}Mg(^{32}S,α2pγ), except as noted, based on γ(θ) and γγ(θ) measurements together with band associations from γγ coincidence data.
[@] 1^+ from (p,p′) E=201 MeV (1989Wi13), interpreted as spin-flip transition from forward angle cross sections.
[&] $T_{1/2}$ from DSAM, as given in ^{28}Si(^{28}Si,α2pγ) dataset, width from (γ,γ′), except as noted.
[a] From γ(θ,pol) in (γ,γ′) (2016Pa04).
[b] Band(A): g.s. band.
[c] Seq.(B): γ cascade based on 5^-.
[d] Seq.(C): γ cascade based on 11^+.

$\gamma(^{50}Cr)$

See (p,p′γ) and ^{50m}Mn β^+ decay for possible but unobserved transitions.

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ[†]	α[&]	Comments
783.31	2^+	783.3 *1*	100	0.0	0^+	E2			B(E2)(W.u.)=19.3 *6* E_γ: weighted average of 783.3 *1* from ^{50}Mn ε decay (1.75 min), 783.6 *3* from (^{32}S,α2pγ), 783.3 *3* from (^{28}Si,α2pγ), 783.3 *5* from (γ,γ′), 783.4 *2* from (p,p′γ), and 783.3 *2* from (α,α′γ). Others: 778 *2* from (p,nγ) and 783 *1* from (n,n′γ). Mult.: from γ(θ,pol) in (^{16}O,α2pγ), γγ(DCO) in (^{32}S,α2pγ), and RUL.
1881.42	4^+	1098.1 *2*	100	783.31	2^+	E2			B(E2)(W.u.)=14.7 *+26−19* E_γ: weighted average of 1098.0 *2* from ^{50}Mn ε decay (1.75 min), 1097.9 *3* from (^{32}S,α2pγ), 1098.2 *3* from (^{28}Si,α2pγ), 1097.9 *5* from (^{16}O,α2pγ), 1098.2 *3* from (p,p′γ), and 1098.1 *2* from (α,α′γ). Other: 1107 *3* from (p,nγ). Mult.: from γ(θ,pol) in (^{16}O,α2pγ), γγ(DCO) in (^{32}S,α2pγ), and RUL.
2924.6	2^+	2141.5 *4*	100 *5*	783.31	2^+	(M1(+E2))	−0.03 *6*		B(M1)(W.u.)=0.22 *+5−4* E_γ: others: 2138 *1* from (n,n′γ), 2140 *5* from (p,nγ). Mult.: D(+Q) from γ(θ) in (p,p′γ); Δπ=no from level scheme.
		2924 *2*	9.0 *24*	0.0	0^+	E2			B(E2)(W.u.)=2.1 *+11−8* Mult.: Q from γ(θ) in (p,p′γ) and M2 ruled out by RUL.
3161.3	2^+	2378.3 *5*	100	783.31	2^+	M1+E2	+0.24 *9*		B(E2)(W.u.)=3.4 *+38−22*; B(M1)(W.u.)=0.142 *+30−24* Mult.,δ: D+Q from pγ(θ) in (p,p′γ); M2 ruled out by RUL.
3164.06	6^+	1282.5 *2*	100	1881.42	4^+	E2			B(E2)(W.u.)=19 *+8−4* E_γ: weighted average of 1282.4 *3* from ^{50}Mn ε decay (1.75 min), 1282.3 *3* from (^{32}S,α2pγ), 1282.1 *3* from (^{28}Si,α2pγ), 1282.6 *5* from (^{16}O,α2pγ), 1282.7 *7* from (p,p′γ), and 1282.7 *2* from (α,α′γ). Mult.: from γ(θ,pol) in (^{16}O,α2pγ), γγ(DCO) in (^{32}S,α2pγ), and RUL.
3324.56	4^+	161[b]	≤3	3164.06	6^+	[E2]		0.0674	α(K)=0.0596; α(L)=0.00583 E_γ,I_γ: possible γ from 1.75-min ^{50}Mn decay only.
		1443.3 *2*	100 *7*	1881.42	4^+	(M1(+E2))	−0.02 *+16−52*		B(M1)(W.u.)=0.073 *28* E_γ: weighted average of 1443.3 *2* from ^{50}Mn ε decay (1.75 min), 1443.3 *3* from (^{28}Si,α2pγ), 1443.1 *5* from (^{16}O,α2pγ), and 1442.7 *7* from (p,p′γ). Mult.: D(+Q) from γ(θ) in (p,p′γ); Δπ=no from level scheme.
		2541.0 *3*	0.8	783.31	2^+	[E2]			B(E2)(W.u.)=0.039 *+30−16* E_γ,I_γ: from (^{28}Si,α2pγ).
3594.63	2^+,3,4^+	1713.2 *3*	70 *10*	1881.42	4^+				

$^{50}_{24}Cr_{26}$-8

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

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	δ[†]	Comments
3594.63	$2^+,3,4^+$	2811.2 3	100 10	783.31	2^+			
3611.4	4^+	449[ab] 2	≈8[a]	3164.06	6^+	[E2]		
		449[ab] 2	≈8[a]	3161.3	2^+	[E2]		
		1729.9[a] 3	100[a] 11	1881.42	4^+			
3628.9	1^+	2845.5[@] 6	49[@] 1	783.31	2^+	[M1][@]		E_γ: weighted average of 2845.0 5 from (γ,γ') and 2846.1 6 from $(p,p'\gamma)$. I_γ: from (γ,γ'). Others: 50 5 from ^{50}Mn ε decay, 50 22 from $(p,p'\gamma)$.
		3628.7 7	100	0.0	0^+	M1		E_γ: weighted average of 3628.0 5 from (γ,γ') and 3629.3 5 from $(p,p'\gamma)$. Mult.: from $\gamma(\theta)$ and polarization asymmetry in (γ,γ').
3698.2	2^+	2914.8 5	100	783.31	2^+	M1+E2	+0.71 23	B(E2)(W.u.)=6.4 +41−33; B(M1)(W.u.)=0.046 +20−14 Mult.,δ: D+Q from p$\gamma(\theta)$ in $(p,p'\gamma)$; M2 ruled out by RUL.
3792.1	(5^+)	467.8 5	100 9	3324.56	4^+	D+Q		E_γ: weighted average of 467.9 5 from $(^{16}O,\alpha 2p\gamma)$ and 467.7 8 from $(p,p'\gamma)$. I_γ: from $(p,p'\gamma)$ (1968Mo07). Others: 100 16 from $(^{16}O,\alpha 2p\gamma)$, 100 11 from 1972Ra14 in $(p,p'\gamma)$. Mult.: from $\gamma(\theta)$ in $(p,p'\gamma)$.
		1910.8 8	100 12	1881.42	4^+	(M1+E2)	−0.47 16	E_γ: weighted average of 1910.9 9 from $(^{16}O,\alpha 2p\gamma)$ and 1910.7 8 from $(p,p'\gamma)$. I_γ: weighted average of 79 9 from $(p,p'\gamma)$ (1968Mo07) and 79 16 from $(^{16}O,\alpha 2p\gamma)$. Other: 133 23 from 1972Ra14 in $(p,p'\gamma)$ is in disagreement. Mult.,δ: D+Q from p$\gamma(\theta)$ in $(p,p'\gamma)$; RUL forbids M2. But $\gamma(\theta)$ data in $(^{28}Si,\alpha 2p\gamma)$, suggesting pure dipole, is in disagreement with results from $(p,p'\gamma)$.
3825.7	$(6)^+$	661.6 3	100 4	3164.06	6^+			E_γ: weighted average of 661.5 3 from ^{50}Mn ε decay (1.75 min), 661.5 3 from $(^{28}Si,\alpha 2p\gamma)$, 661.7 5 from $(^{16}O,\alpha 2p\gamma)$, and 661.9 6 from $(\alpha,\alpha'\gamma)$. Other: 662 2 from $(p,p'\gamma)$. I_γ: from ^{50}Mn β^+ decay (1.75 min).
		1944.4 3	15.2 20	1881.42	4^+			E_γ: weighted average of 1944.5 5 from ^{50}Mn ε decay (1.75 min) and 1944.4 3 from $(^{28}Si,\alpha 2p\gamma)$. I_γ: from ^{50}Mn β^+ decay (1.75 min).
3844.4	$2^+,3,4^+$	683.4 10	22 6	3161.3	2^+			
		1962.9 4	100 11	1881.42	4^+			
		3060.9 6	50 11	783.31	2^+			
3875.4	$(4^+,5,6^+)$	551.0 3	≈33	3324.56	4^+			E_γ: from $(^{28}Si,\alpha 2p\gamma)$. Other: 550 2 from $(p,p'\gamma)$.
		711.1 3	67 17	3164.06	6^+			E_γ: from $(^{28}Si,\alpha 2p\gamma)$. Other: 711.1 6 from $(p,p'\gamma)$.
		1993.8 37	100 33	1881.42	4^+			E_γ: from $(^{28}Si,\alpha 2p\gamma)$. Other: 1993.8 6 from $(p,p'\gamma)$.
3895.4	0^+	732[ab] 2	≈5[a]	3161.3	2^+	[E2]		B(E2)(W.u.)=0.5 +15−4
		3112.0 10	100 40	783.31	2^+	[E2]		B(E2)(W.u.)=0.007 +6−3 Mult.,δ: δ(J=1)=−0.09 29, δ(J=2)=+0.34 13 from p$\gamma(\theta)$ in $(p,p'\gamma)$ which suggests D(+Q), but ΔJ^π requires E2 if the parent level is the same one as the 0^+,3895 level in (p,t).
3937.3	$2^+,3,4^+$	1014.3 9	≈17	2924.6	2^+			
		2055.5 4	100 17	1881.42	4^+			
		3153.7 20	≈83	783.31	2^+			

$^{50}_{24}Cr_{26}$-9

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

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	Comments
4051.7	3^-	441[ab] 2	≈5[a]	3611.4	4^+	[E1]	B(E1)(W.u.)=2.7×10^{-4} +34−17
		458[b] 2	≈2	3594.63	2^+,3,4^+		
		890.6 5	41 7	3161.3	2^+	[E1]	B(E1)(W.u.)=0.00027 +17−10
		1126.9 5	100 9	2924.6	2^+	[E1]	B(E1)(W.u.)=0.00032 +12−10
		3267.4 14	45 16	783.31	2^+	[E1]	B(E1)(W.u.)=5.9×10^{-6} +43−28
4068.2	0^+	441[ab] 2	≈7[a]	3628.9	1^+		
		3284.8 22	100 25	783.31	2^+	[E2]	
4129.9	(1,2^+)	500 2	≈2	3628.9	1^+		
		1205.3 4	38 6	2924.6	2^+		
		4130[b] 3	≈100	0.0	0^+		
4193.0	2^+	494[ab] 2	≈10[a]	3698.2	2^+		
		1268.3 8	35 5	2924.6	2^+		
		3410.1 20	40 10	783.31	2^+		
		4193[b] 3	≈100	0.0	0^+		
4367.2	5^-	542[#]	61[#]	3825.7	$(6)^+$		
		575.3[#] 3	100[#]	3792.1	(5^+)		
		755[#]		3611.4	4^+		
		1042[#]	34[#]	3324.56	4^+		
		1203[#] 1	37[#]	3164.06	6^+		
		2485[#]	32[#]	1881.42	4^+		
4523.8	(4^+)	732[ab] 2	≈15[a]	3792.1	(5^+)		
		1363[ab] 2	≈38[a]	3164.06	6^+		
		1363[ab] 2	≈38[a]	3161.3	2^+		
		1599 2	≈15	2924.6	2^+		
		3740.5 20	100 23	783.31	2^+		
4546.3	3^-	494[ab] 2	≈33[a]	4051.7	3^-		
		1384.8 15	≈100	3161.3	2^+		
		1622 2	≈67	2924.6	2^+		
		2665[b]	≤80	1881.42	4^+		
		3763 3	83 33	783.31	2^+		
4653.3		955 2	≈33	3698.2	2^+		
		1493[b] 2	≈10	3161.3	2^+		
		1730.0[ab] 3	323[a] 36	2924.6	2^+		
		3870 2	100 29	783.31	2^+		
4744.9	8^+	1580.8 3	100	3164.06	6^+	E2	B(E2)(W.u.)=19 +6−4 E_γ: weighted average of 1580.5 3 from (^{32}S,α2pγ), 1580.9 3 from (^{28}Si,α2pγ), 1581.1 5 from (^{16}O,α2pγ), and 1581.2 5 from (α,$\alpha'\gamma$). Mult.: from $\gamma(\theta$,pol) in (^{16}O,α2pγ), $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in (^{32}S,α2pγ).

$^{50}_{24}Cr_{26}$-10

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

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	Comments
4997.1	$1^{(+)}$	4213.8[@] *5*	100[@] *10*	783.31	2^+	[M1][@]	
		4996.7[@] *5*	100[@]	0.0	0^+	(M1)[@]	Mult.: from $\gamma(\theta)$ and polarization asymmetry in (γ,γ').
5213.4	(6^-)	846.2[#] *3*	100[#] *10*	4367.2	5^-		
		1388[#]		3825.7	$(6)^+$		
		1421.1[#] *3*	80[#] *7*	3792.1	(5^+)		
5931.2	1^+	5930.8[@] *5*	100	0.0	0^+	M1[@]	Mult.: from $\gamma(\theta)$ and polarization asymmetry in (γ,γ').
5998.0	(7^-)	784.6[#] *3*	68[#] *18*	5213.4	(6^-)		
		1630.9[#] *3*	100[#] *18*	4367.2	5^-		
6340.6	10^+	1595.7 *2*	100	4744.9	8^+	E2	B(E2)(W.u.)=6.6 *+15−10* E_γ: weighted average of 1595.2 *3* from (^{32}S,α2pγ), 1595.9 *3* from (^{28}Si,α2pγ), 1595.7 *5* from (^{16}O,α2pγ), and 1596.5 *5* from $(\alpha,\alpha'\gamma)$. Mult.: from $\gamma(\theta$,pol) in (^{16}O,α2pγ), $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in (^{32}S,α2pγ).
6754.5	10^+	414.1 *5*	15.3 *14*	6340.6	10^+		E_γ: unweighted average of 414.5 *3* from (^{32}S,α2pγ) and 413.6 *3* from (^{28}Si,α2pγ). I_γ: weighted average of 18 *6* from (^{32}S,α2pγ) and 15.2 *14* from (^{28}Si,α2pγ).
		2009.6 *3*	100 *10*	4744.9	8^+	E2	E_γ: weighted average of 2009.3 *3* from (^{32}S,α2pγ) and 2009.8 *3* from (^{28}Si,α2pγ). I_γ: from (^{28}Si,α2pγ). Other: 100 *12* from (^{32}S,α2pγ). Mult.: Q from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in (^{32}S,α2pγ), $\gamma\gamma$(ADO) in (^{28}Si,α2pγ); M2 ruled out by RUL.
6950.6	11^+	196.0 *4*	3.0 *3*	6754.5	10^+	(M1)	B(M1)(W.u.)=0.174 *22* E_γ: weighted average of 196.3 *3* from (^{32}S,α2pγ) and 195.6 *3* from (^{28}Si,α2pγ). I_γ: weighted average of 3.4 *11* from (^{32}S,α2pγ) and 3.0 *3* from (^{28}Si,α2pγ). Mult.: D from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in (^{32}S,α2pγ); $\Delta\pi$=no from level scheme.
		610.2 *3*	100.0 *15*	6340.6	10^+	M1	B(M1)(W.u.)=0.192 *16* E_γ: weighted average of 610.3 *3* from (^{32}S,α2pγ), 610.1 *3* from (^{28}Si,α2pγ), and 609.9 *5* from (^{16}O,α2pγ). I_γ: from (^{28}Si,α2pγ). Others: 100 *11* from (^{16}O,α2pγ), 100 *10* from (^{32}S,α2pγ). Mult.: from $\gamma(\theta$,pol) in (^{16}O,α2pγ), $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in (^{32}S,α2pγ).
7600.8	1^+	7600.2[@] *5*	100	0.0	0^+	M1[@]	
7613.1	12^+	662.2 *3*	100.0 *15*	6950.6	11^+	M1	B(M1)(W.u.)=0.66 *6* E_γ: weighted average of 662.4 *3* from (^{32}S,α2pγ), 662.2 *3* from (^{28}Si,α2pγ), and 661.8 *5* from (^{16}O,α2pγ). I_γ: other: 100 *10* from (^{32}S,α2pγ) and (^{16}O,α2pγ). Mult.: from $\gamma(\theta$,pol) in (^{16}O,α2pγ), $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) from (^{32}S,α2pγ).
		1272.2 *3*	2.9 *3*	6340.6	10^+	[E2]	B(E2)(W.u.)=4.0 *8* E_γ: weighted average of 1272 *1* from (^{32}S,α2pγ) and 1272.2 *3* from (^{28}Si,α2pγ). I_γ: weighted average of 4.3 *15* from (^{32}S,α2pγ) and 2.8 *3* from (^{28}Si,α2pγ). Other: <4.9 from (^{16}O,α2pγ).
7645.7	1^+	7645.1[@] *5*	100	0.0	0^+	M1[@]	
7948.2	1^+	7164.5[@] *5*	27[@] *2*	783.31	2^+	[M1]	

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

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.	Comments
7948.2	1^+	7947.4@ *5*	100@	0.0	0^+	M1@	
8045.8	1^+	8045.1@ *5*	100	0.0	0^+	M1@	
8121.5	1^+	8120.8@ *5*	100	0.0	0^+	M1@	
8527.6	1^+	7743.1@ *5*	39@ *6*	783.31	2^+	[M1]	
		8527.4@ *5*	100@	0.0	0^+	M1@	
8885.6	1^+	8884.8@ *5*	100	0.0	0^+	M1@	
9007.9	1^+	9007.0@ *5*	100	0.0	0^+	M1@	
9208.3	1^+	9207.4@ *5*	100	0.0	0^+	M1@	
9327.1	(12^+)	1713.8‡ *3*	85‡ *25*	7613.1	12^+		
		2572.6‡ *3*	100‡ *35*	6754.5	10^+	(Q)	
		2987‡ *1*	<50‡	6340.6	10^+		
9409.5	1^+	9408.5@ *5*	100	0.0	0^+	M1@	
9579.1	1^+	9578.1@ *5*	100	0.0	0^+	M1@	
9642.2	13^+	2028.9 *8*	100# *10*	7613.1	12^+	D	E_γ: unweighted average of 2028.1 *3* from ($^{32}S,\alpha2p\gamma$) and 2029.7 *3* from ($^{28}Si,\alpha2p\gamma$). Mult.: from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in ($^{32}S,\alpha2p\gamma$) and ($^{28}Si,\alpha2p\gamma$).
		2692.0# *3*	4.8# *10*	6950.6	11^+	E2	B(E2)(W.u.)=0.34 *+40−16* Mult.: Q from γ(ADO) in ($^{28}Si,\alpha2p\gamma$); M2 ruled out by RUL.
9719.1	1^+	9718.1@ *5*	100	0.0	0^+	M1@	
9914.8	14^+	273.1 *3*	15# *2*	9642.2	13^+	D	E_γ: weighted average of 273.3 *3* from ($^{32}S,\alpha2p\gamma$) and 272.9 *3* from ($^{28}Si,\alpha2p\gamma$). I_γ: other: 44 *4* from $^{24}Mg(^{32}S,\alpha2p\gamma)$ is in disagreement.
		2302.0 *12*	100# *10*	7613.1	12^+	E2	E_γ: unweighted average of 2300.9 *3* from ($^{32}S,\alpha2p\gamma$) and 2303.2 *3* from ($^{28}Si,\alpha2p\gamma$). I_γ: also from ($^{32}S,\alpha2p\gamma$).
10797.5	$13^{(+)}$	3183.9‡ *3*	100	7613.1	12^+	D	Mult.: from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in ($^{32}S,\alpha2p\gamma$) and ($^{28}Si,\alpha2p\gamma$).
11013.9	13^+	3400.5‡ *3*	100‡	7613.1	12^+	D	Mult.: from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in ($^{32}S,\alpha2p\gamma$), and $\gamma\gamma$(ADO) in ($^{28}Si,\alpha2p\gamma$).
12391.5	$15^{(+)}$	1593.6‡ *3*	100‡ *14*	10797.5	$13^{(+)}$		
		2476.9‡ *3*	40‡ *9*	9914.8	14^+	D	Mult.: from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in ($^{32}S,\alpha2p\gamma$).
12542.0	(14^+)	4927.9‡ *10*	100	7613.1	12^+		
13218.4	15^+	2204.2‡ *3*	100‡ *10*	11013.9	13^+	E2	Mult.: Q from $\gamma\gamma$(ADO) in ($^{32}S,\alpha2p\gamma$) and $\gamma\gamma$(DCO) in ($^{28}Si,\alpha2p\gamma$); M2 ruled out by RUL.
		3304.8 *15*	54 *5*	9914.8	14^+	D	E_γ: unweighted average of 3303.3 *3* from ($^{32}S,\alpha2p\gamma$) and 3306.3 *3* from ($^{28}Si,\alpha2p\gamma$). I_γ: from ($^{32}S,\alpha2p\gamma$). Mult.: from γ(DCO) in ($^{32}S,\alpha2p\gamma$).
		3578.7 *16*	54 *9*	9642.2	13^+	E2	E_γ: unweighted average of 3577.1 *10* from ($^{32}S,\alpha2p\gamma$) and 3580.3 *10* from ($^{28}Si,\alpha2p\gamma$). Mult.: Q from $\gamma\gamma$(ADO) in ($^{28}Si,\alpha2p\gamma$); M2 ruled out by RUL.
13495.3		3853# *2*		9642.2	13^+		
13641.0	$14^{(+)}$	2627.1‡ *3*	100	11013.9	13^+	D	Mult.: from $\gamma\gamma$(ADO) in ($^{32}S,\alpha2p\gamma$).

$^{50}_{24}Cr_{26}$-12

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

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.	Comments
13920.8	$15^{(+)}$	4005.8‡ *10*	100	9914.8	14^+	D	Mult.: from $\gamma\gamma$(DCO) and $\gamma\gamma$(ADO) in (^{32}S,α2pγ) and (^{28}Si,α2pγ).
15034.2	16^+	1815.8 *4*	30 *5*	13218.4	15^+		E_γ: weighted average of 1815.5 *3* from (^{32}S,α2pγ) and 1816.2 *3* from (^{28}Si,α2pγ). I_γ: weighted average of 29 *5* from (^{32}S,α2pγ) and 33 *7* from (^{28}Si,α2pγ).
		2492.1‡ *3*	9‡ *5*	12542.0	(14^+)		
		5121 *2*	100# *22*	9914.8	14^+	E2	E_γ: unweighted average of 5119.1 *10* from (^{32}S,α2pγ) and 5123.4 *10* from (^{28}Si,α2pγ). Mult.: Q from $\gamma\gamma$(ADO) in (^{32}S,α2pγ) and M2 ruled out by RUL.
15809.0	16^+	2168.1‡ *3*	38‡ *11*	13641.0	$14^{(+)}$	E2	Mult.: Q from $\gamma\gamma$(ADO) in (^{32}S,α2pγ) and M2 ruled out by RUL.
		2590.5‡ *3*	100‡ *22*	13218.4	15^+		
16049.4	$17^{(+)}$	2830.9‡ *3*	100	13218.4	15^+	Q	Mult.: Q from $\gamma\gamma$(ADO) in (^{32}S,α2pγ).
17669.2	(16,17)	3748.2 *10*	100	13920.8	$15^{(+)}$		
17790.0	(16,17)	5398.2 *10*	100	12391.5	$15^{(+)}$		
17956.6	18^+	2922.3 *7*	100	15034.2	16^+	E2	E_γ: unweighted average of 2921.6 *3* from (^{32}S,α2pγ) and 2923.0 *3* from (^{28}Si,α2pγ).

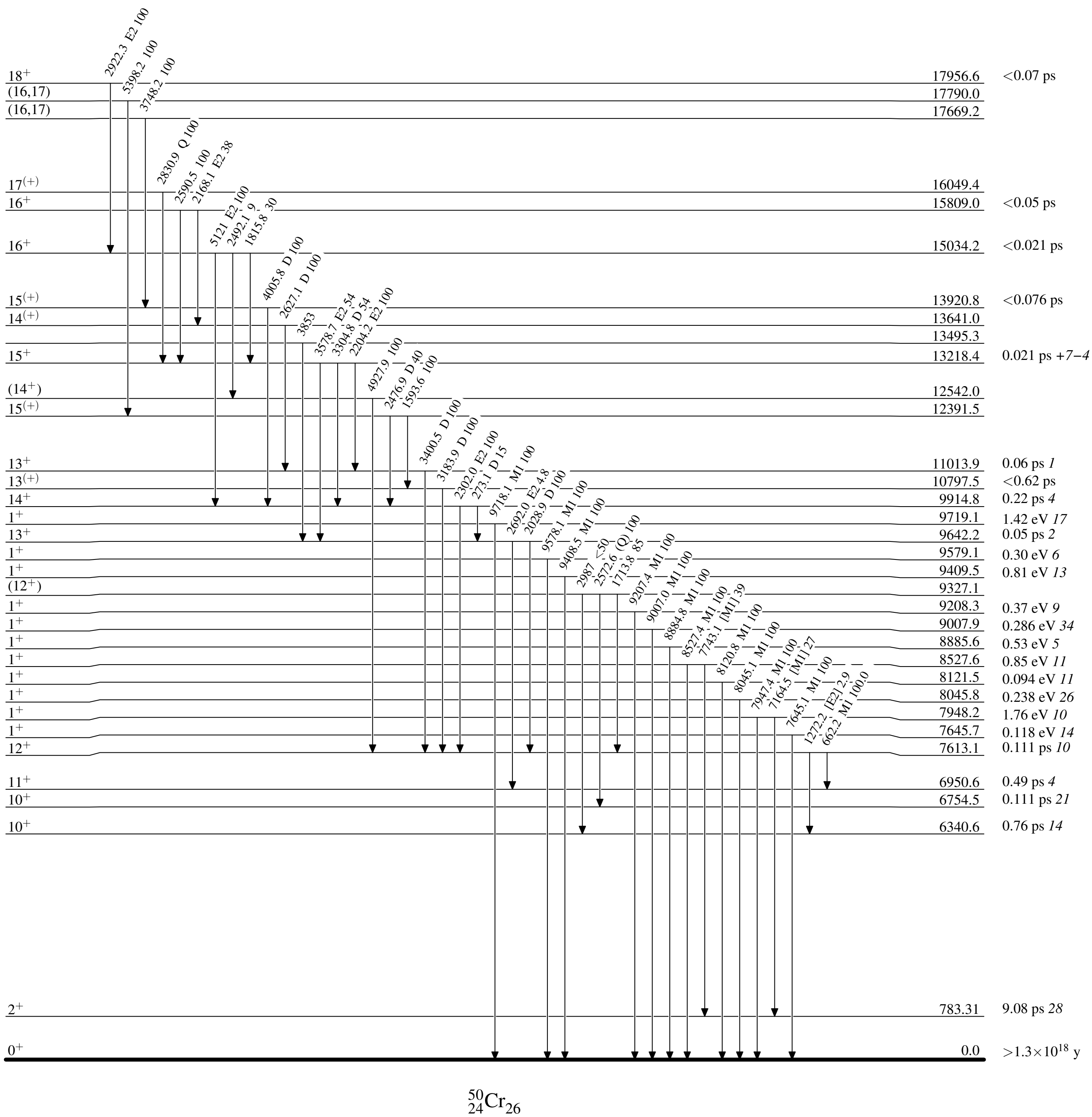
† From $^{50}Cr(p,p'\gamma)$, except as noted.
‡ From $^{24}Mg(^{32}S,\alpha 2p\gamma)$.
# From $^{28}Si(^{28}Si,\alpha 2p\gamma)$.
@ From (γ,γ'),(pol γ,γ'). Mult. are based on $\gamma(\theta$,pol) data (2016Pa04).
& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[a] Multiply placed with undivided intensity.
[b] Placement of transition in the level scheme is uncertain.

$^{50}_{24}Cr_{26}$-13

Adopted Levels, Gammas

Level Scheme

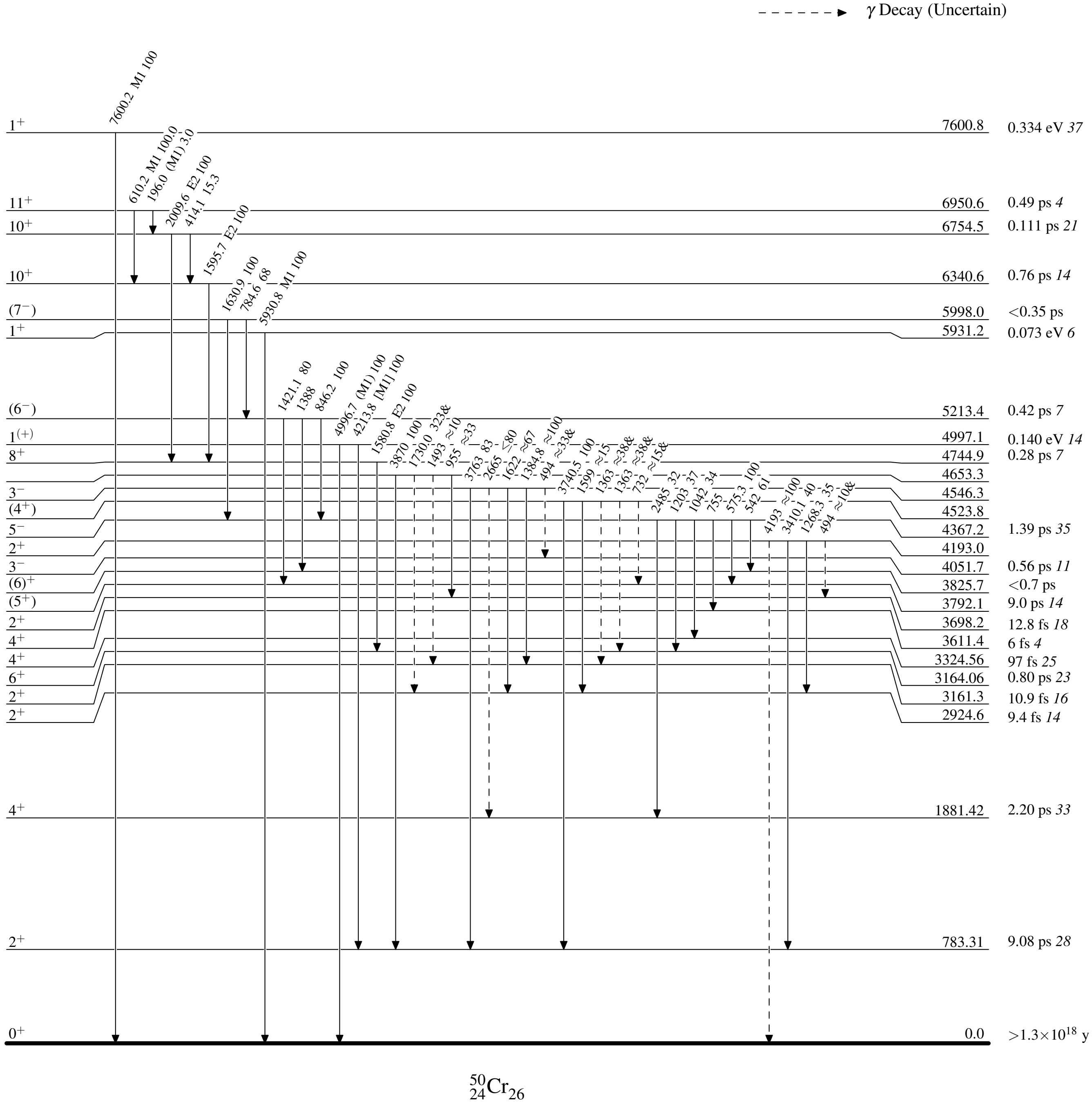
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

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



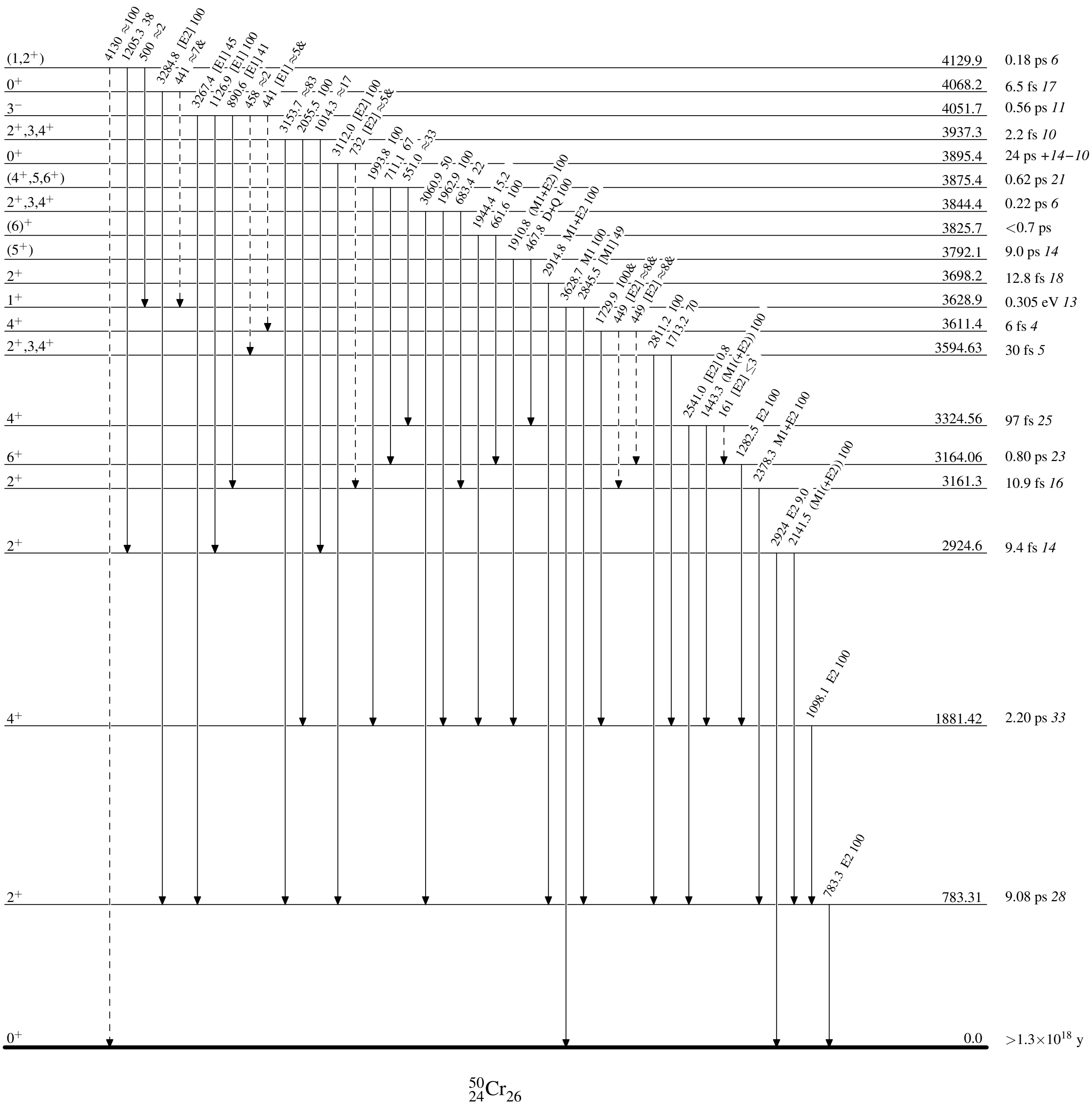
Adopted Levels, Gammas

Legend

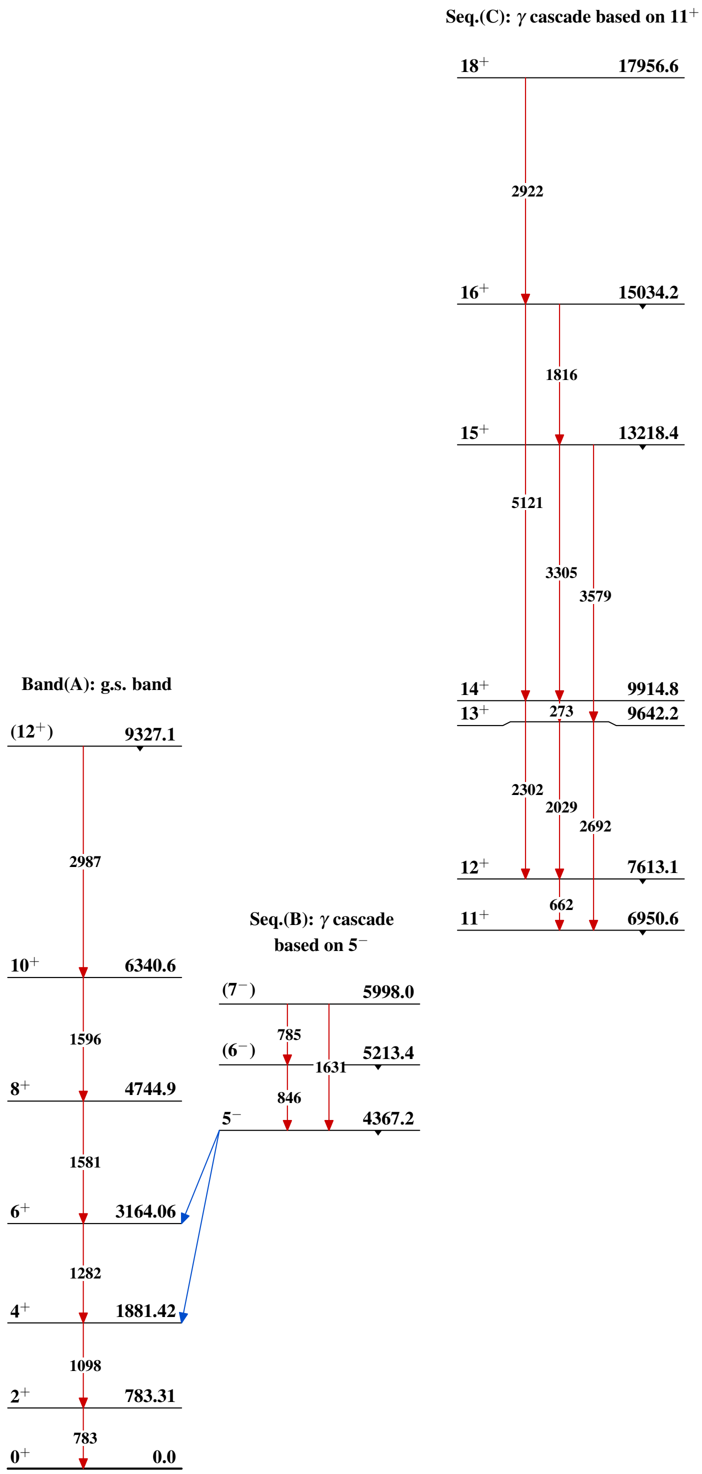
Level Scheme (continued)

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

γ Decay (Uncertain)



Adopted Levels, Gammas



$^{50}_{24}Cr_{26}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yang Dong, Huo Junde	NDS 128, 185 (2015)	10-Jul-2015

Q(β^-)=−4711.2 *19*; S(n)=12038.4 *9*; S(p)=10503.4 *9*; Q(α)=−9351.3 *6* 2012Wa38

Other reactions: ^{48}Ti(α,γ) E=6-12 MeV, 1976Fo04; ^{48}Ti(^{16}O,^{12}C) E=120 MeV (1979Da07); ^{53}Cr(^{12}C,^{13}C) E=18.5-33 MeV (1974PaZZ); ^{54}Fe(^{18}O,^{20}Ne) E=48,50 MeV (1972SiYD,1975PeZM).

^{52}Cr Levels

Cross Reference (XREF) Flags

A	^{52}V β^- decay (3.743 min)	M	^{52}Cr(γ,γ'),(pol γ,γ')	Y	^{52}Cr(^{16}O,^{16}O′),(^{18}O,^{18}O′)
B	^{52}Mn ε decay (5.591 d)	N	^{52}Cr(e,e′)	Z	Coulomb excitation
C	^{52}Mn ε decay (21.1 min)	O	^{52}Cr(π^+,π^+),(π^+,$\pi^{+\prime}$)	Others:	
D	(HI,xnγ)	P	^{52}Cr(n,n′)	AA	^{50}Cr(α,^{2}He)
E	^{50}Ti(^{3}He,n)	Q	^{52}Cr(n,n′γ)	AB	^{53}Cr(p,d)
F	^{52}Cr(p,p′γ)	R	^{50}V(α,d)	AC	^{53}Cr(d,t),(pol d,t)
G	^{52}Cr(p,p′)	S	^{50}Ti(^{16}O,^{14}C)	AD	^{53}Cr(^{3}He,α)
H	^{50}Cr(t,p)	T	^{52}Cr(d,d′)	AE	^{54}Cr(p,t)
I	^{51}V(p,γ) E=res:IAR	U	^{52}Cr(^{3}He,^{3}He′)	AF	^{55}Mn(μ^-,3nγ)
J	^{51}V(^{3}He,d)	V	^{52}Cr(α,α')	AG	^{51}V(α,t)
K	^{51}V(^{3}He,dγ)	W	^{52}Cr(^{7}Li,^{7}Li′)	AH	^{56}Fe(d,^{6}Li)
L	^{55}Mn(p,α)	X	^{52}Cr(^{12}C,^{12}C′),(^{13}C,^{13}C′)	AI	Ni(K$^-$,x rayγ),(π^+,xγ),(π^-,Xγ)

E(level)[†]	J$^\pi$	T$_{1/2}$[m]	XREF	Comments
0.0[p]	0$^+$	stable	ABCDEFGHIJKLMNO Q S UVWXYZ	XREF: Others: AA, AB, AC, AD, AE, AF, AG, AH, AI rms charge radius=3.6424 fm *21* (2004An14). others: rms charge radius=3.61 fm *8*, muonic x-ray (1962Jo05), rms charge radius=3.674 fm *15* (1976Li19) (e,e′).
1434.091[p] *14*	2$^+$	0.783 ps *21*	ABCDEFGHIJKLMNOPQ STUVWXYZ	XREF: Others: AB, AC, AD, AE, AF, AG, AH, AI μ=+2.41 *13* (2000Er01) Q=−0.082 *16* (1989Ra17) J$^\pi$: E2 γ to 0$^+$. T$_{1/2}$: From Coulomb Ecitation. Other: 0.69 PS +31-17 (^{3}He,dγ) and>0.49 ps (n,nγ). μ: Others: +3.0 *5* (1987St07) and +3.2 *22* (1987Pa28).
2369.630[p] *18*	4$^+$	6.7 ps *+35−17*	ABCD FG IJKL NOPQ ST VW Z	XREF: Others: AB, AC, AD, AE, AF, AG, AH B(E4)↑=0.00066 *8* XREF: K(2368)L(2371)T(2372)AD(2380). J$^\pi$: L(α,α')=4. B(E4)↑: from weighted average of 0.00067 *12* in (e,e′) and 0.00066 *10* in (π^+,π^+),(π^+,$\pi^{+\prime}$). T$_{1/2}$: From DSAM (Coulomb Ecitation). Others: 9.4 ps *+24−16*, DSAM (HI,xnγ), 1.04 PS *+35−17* (^{3}He,dγ) DSAM.
2646.9 *6*	0$^+$		A FGH L NO Q S V	XREF: Others: AB, AC, AE, AH XREF: H(2660)L(2650)N(2650)O(2650)S(2640)V(2650) AC(2640)AH(2650). J$^\pi$: L(p,p′)=L(e,e′)=L(t,p)=L(p,t)=0.
2767.767 *21*	4$^+$	1.9 ps *5*	ABCD FG IJKL NO Q ST VW	XREF: Others: AA, AB, AC, AD, AE, AG XREF: N(2770)O(2770)V(2770)AA(2770)AC(2770)AD(

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[m]	XREF	Comments
				J^π: L(α,α')=4. $T_{1/2}$: DSAM, from weighted average of values 1.4 ps +5−3 (^{3}He,dγ) and 2.5 ps 6 (HI,xnγ).
2964.786 17	2^+	0.42 ps 8	A C FGHIJKL NO Q ST V	XREF: Others: AB XREF: H(2974)N(2970)O(2960)V(2960). J^π: E2 γ to 0^+. $T_{1/2}$: from (p,p$'\gamma$). Others: 0.47 ps +22−13, DSAM (^{3}He,dγ), 0.42 ps 21 (n,n$'\gamma$).
3113.858[p] 21	6^+	41.4 ps 14	B D G IJKL N Q S VW	XREF: Others: AA, AB, AG, AH XREF: N(3110)V(3110)AA(3110)AG(3110)AH(3110). J^π: L(p,p$'$)=6, E2 γ to 4^+. $T_{1/2}$: RDM. Other: >1.8 ps (^{3}He,dγ), DSAM.
3161.74 6	2^+	0.035[n] ps 7	A C FGHI KLMNO Q VW	XREF: Others: AB, AE, AH XREF: H(3175)AE(3168). J^π: L(α,α')=2. $T_{1/2}$: Others: 0.08 ps +4−3 (^{3}He,dγ) and 33 fs 5 (p,p$'\gamma$).
3415.32[q] 3	4^+	0.26 ps 7	AB D FG IJKL O Q V	XREF: Others: AB, AD XREF: J(3420)O(3420)V(3450)AB(3432)AD(3418). J^π: L(p,p$'$)=4. $T_{1/2}$: from weighted average of values 0.22 ps +8−5 (^{3}He,dγ) and 0.33 ps 9 (HI,xnγ).
3472.25 15	3^+	7.2 ps 8	A CD FG I KL Q S	XREF: Others: AB, AC, AD, AG XREF: S(3440)AB(3494)AC(3460)AG(3440). J^π: 1968Mo19 propose the existence of two levels in this vicinity separated by 3.0 keV, one decaying by 703γ and having a spin of 3, 5 (from p,p$'\gamma(\theta)$), and another with spin 2 decaying by 2038γ. Subsequent work (1977Ya08, 1974Br04) shows that a single level at 3472.2 emits two γ's (704.6 (78%) and 2038.0 (22%)) and suggests that the two-level hypothesis was a result of an error in the energy assigned to the 704γ by 1968Mo19. Furthermore, the p,p$'\gamma(\theta)$ data on the 2038γ (1968Mo19) were found to be consistent with 3. $T_{1/2}$, together with L in transfer, suggest π=+. One further complication is the assignment of L=4 to the level by 1970Pr08 in (p,p$'$). L(p,p$'$)=2+3. Thus existence of a $J^\pi=4^+$ level at 3472 is tentatively ruled out. $T_{1/2}$: RDM. Other: >1.9 ps (^{3}He,dγ), DSAM, GT 0.49 ps (n,n$'\gamma$).
3615.924 22	5^+	2.6 ps 12	B D G IJKL	XREF: Others: AB XREF: J(3620)L(3619). J^π: log ft=6.15 from 6^+, $\gamma(\theta)$ in (HI,xnγ); π from L(^{3}He,d)=1. $T_{1/2}$: from 1.4 ps<$T_{1/2}$<3.8 ps, lower limit, DSAM; upper, RDM. Other: >0.76 ps in (^{3}He,dγ), and 0.10 ps 7 (n,n$'\gamma$).
3739.6[a]	$1^+,1^-,2^+$		M	J^π: From (γ,γ') (1998En05), based on values of reduced transition strengths(↑).
3771.72 14	2^+	9 fs 2	A C EFGH JKLMNO Q S V	XREF: Others: AB, AC, AD, AG XREF: E(3700)H(3781)S(3780)V(3780)AB(3767)AC

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J$^\pi$	$T_{1/2}$[m]	XREF	Comments
				J$^\pi$: L(α,α')=2, L(^{3}He,d)=1. B(E2)↑=0.0071 *8* (2007En02). $T_{1/2}$: from weighted average of values 9 fs *3* (n,n$'\gamma$) and 9 fs *4* (p,p$'\gamma$).
3947.5 *6*	2$^+$	0.014[n] ps *7*	G I KL Q	XREF: Others: AB XREF: G(3949)AB(3926). J$^\pi$: L(p,p$'$)=2, $T_{1/2}$: other: 0.10 ps *+4−3* (^{3}He,dγ).
3951.2 *10*	2$^+$		C GH J	XREF: G(3949)H(3957). J$^\pi$: L(p,p$'$)=2, L(^{3}He,d)=1 from 7/2$^-$.
4015.51[q] *3*	5$^+$	0.61 ps *+27−19*	B D G IJKL	XREF: Others: AD XREF: J(4020)AD(4017). J$^\pi$: log *ft*=6.6 from 6$^+$, π from L(^{3}He,d)=1. $T_{1/2}$: from weighted average of values 0.58 ps *+32−19* (^{3}He,dγ) and 0.7 ps *5* (HI,xnγ).
4039.1 *11*	4$^+$	26[n] fs *4*	D G IJKL NO V	XREF: Others: AB XREF: J(4033)V(4010)AB(4030). J$^\pi$: L(p,p$'$)=L(α,α')=4. $T_{1/2}$: other: 0.51 ps *+25−14* (^{3}He,dγ).
4.10×10^3[c] *10*	3$^-$		P	XREF: Others: AC, AG XREF: P(4200)AC(4090). J$^\pi$: L(n,n$'$)=3.
4470	3$^-$		U	E(level): from (^{3}He,^{3}He$'$). J$^\pi$: L(^{3}He,^{3}He$'$)=3.
4563.0 *8*	3$^-$	40[n] fs *6*	C GH JKL NOPQ S V X	B(E3)↑=0.0066 *3* XREF: H(4572)P(4600)V(4560). J$^\pi$: L(α,α')=L(e,e$'$)=3. $T_{1/2}$: other: 0.27 ps *+12−6* (^{3}He,dγ). B(E3) from weighted average of values 0.0065 *4* in (e,e$'$) and 0.0068 *5* in (π^+,π^+),(π^+,$\pi^{+\prime}$).
4584.0 *7*	(6$^+$)		D	J$^\pi$: From (HI,xnγ), γ to 6$^+$.
4611	(3,4)$^+$		I	XREF: Others: AD XREF: AD(4605). J$^\pi$: L(^{3}He,α)=3 on 3/2$^-$.
4627.32 *19*	4$^+$		B G J L O	XREF: Others: AG XREF: G(4630)L(4630)O(4630)AG(4680). J$^\pi$: L(p,p$'$)=4.
4702 *5*	2$^+$		E G J L O	XREF: E(4710)L(4706)O(4710). J$^\pi$: L(^{3}He,n)=2.
4730[f]	4$^+$		J V	J$^\pi$: L(α,α')=4. L(^{3}He,d)=1.
4742.3 *11*	0$^+$		GHI L S	XREF: G(4738)H(4745). J$^\pi$: L(t,p)=0.
4750.31[p] *20*	8$^+$	0.08[n] ps *10*	D QR	XREF: Others: AA XREF: AA(4770). $T_{1/2}$: Other: 0.64 ps *+20−17* (HI,xnγ). J$^\pi$: $\gamma(\theta)$ in (HI,xnγ), E2 γ to 6$^+$.
4800.1[a]	1$^+$,1$^-$,2$^+$		M	J$^\pi$: From (γ,γ') (1998En05).
4805.96[q] *24*	6$^+$	0.49 ps *+28−14*	D G I L	XREF: Others: AA XREF: I(4808)L(4808)AA(4770). J$^\pi$: L(α,^{2}He)=4,6, $\gamma(\theta)$ in (HI,xnγ), M1+E2 γ to 5$^+$.
4815.69 *9*	1$^+$,2$^+$		C	XREF: Others: AD XREF: ad(4830). J$^\pi$: log *ft*=5.55 from 2$^+$, γ to 0$^+$.
4841.3[a] *11*	1$^+$,1$^-$,2$^+$		G IJ LM	XREF: Others: AD

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[m]	XREF	Comments
				XREF: G(4832)ad(4830). J^π: From (γ,γ') (1998En05).
4951 *4*	4^+		G L S	XREF: L(4950)S(4980). J^π: L(p,p′)=4.
5054.3 *11*	4^+		I V	XREF: V(5070). J^π: L(α,α')=4.
5095 *5*	4^+		G J L V	XREF: Others: AG XREF: V(5070)AG(5120). J^π: L(^{3}He,d)=L(α,t)=1, L(p,p′)=L(α,α')=4.
5098.6[a] *4*	1	0.045[o] eV *10*	I M	J^π: excitation in (γ,γ').
5139 *5*	(6^+)		G J L	J^π: L(p,p′)=5,6, L(^{3}He,d)=(3) from $7/2^-$.
5213.7[a] *5*	1	0.013[o] eV *3*	G LM S	J^π: excitation in (γ,γ').
5285 *5*			G J L	XREF: L(5281). J^π: L(^{3}He,d)=0 from $7/2^-$, L(p,p′)=5,6.
5346 *4*	$4^+,6^+$		G L	XREF: Others: AA XREF: AA(5320). J^π: L(α,^{2}He)=4,6.
5396.9[q] *3*	7^+	0.14 ps *+12−9*	D	J^π: $\gamma(\theta)$ in (HI,xnγ), M1+E2 γ to 6^+, E2 γ to 5^+.
5410 *4*	(2^+)		GH j L	XREF: Others: AD XREF: H(5423)j(5420)AD(5400). J^π: L(t,p)=(2).
5425 *5*	4^+		G j L	XREF: j(5420)L(5422). J^π: L(p,p′)=4.
5432 *6*			G	
5446.4 *5*	4^+		HIJ L V	XREF: Others: AG XREF: H(5443)J(5450)L(5450)V(5450)AG(5450). J^π: L(α,α')=4.
5490.8[a]	$1^+,1^-,2^+$		g LM	XREF: g(5494). J^π: excitation in (γ,γ').
5500[b]	3^-		g N	XREF: g(5494). J^π: L(e,e′)=3.
5526.0[a] *5*	1	0.016[o] eV *3*	M	J^π: excitation in (γ,γ').
5541 *5*	4^+		G L	XREF: L(5538). J^π: L(p,p′)=4.
5544.7[a] *10*	(1^+)	0.112[o] eV *7*	G LM	XREF: Others: AD XREF: G(5546)AD(5560). J^π: L(^{3}He,α)=(1) from $3/2^-$, D γ to 0^+.
5563.5 *8*	+		G I L	XREF: G(5569)L(5571). J^π: L(^{3}He,d)=1 from $7/2^-$.
5584 *6*	+		G J L	XREF: J(5594). J^π: L(^{3}He,d)=1 from $7/2^-$.
5600[#] *15*	0^+		E H	XREF: E(5650). J^π: L(t,p)=L(3He,n)=0.
5633.4 *11*	(8^+)		D V	XREF: V(5640). J^π: From (HI,xnγ), γ to (6^+).
5664.4 *11*	$(2)^+$		G IJ L	XREF: Others: AD XREF: G(5661)J(5660)AD(5670). J^π: L(p,p′)=2. L(^{3}He,d)=1+3 from $7/2^-$.
5725.3 *12*	+		G IJ L S	XREF: Others: AD XREF: G(5727)J(5720)S(5700)AD(5710). J^π: L(^{3}He,α)=3 from $3/2^-$.
5737.5 *11*	(4^+)		G I	J^π: L(p,p′)=(4).
5755[#] *15*	+		H j	XREF: j(5751). J^π: L(t,p)=0. But L(^{3}He,d)=1 from $7/2^-$.

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J$^{\pi}$	T$_{1/2}$[m]	XREF	Comments
5796.0[a]	1$^+$,2$^+$		G J LM	XREF: J(5790). J$^{\pi}$: 1,2$^+$ from excitation in (γ,γ'), PI=− ruled out by L(^{3}He,d)=1+3 from 7/2$^-$.
5811 *5*	5,6$^+$		G	J$^{\pi}$: L(p,p′)=5,6.
5818 *6*			G	
5824.7[q] *4*	8$^+$	1.0 ps *+6−4*	D	J$^{\pi}$: $\gamma(\theta)$ in (HI,xnγ), M1+E2 γ to 7$^+$.
5860.5 *11*	+		G IJ	XREF: Others: AG XREF: G(5853)J(5828)AG(5830). J$^{\pi}$: L(^{3}He,d)=L(α,t)=1 from 7/2$^-$.
5865 *6*			G	
5873 *5*	3$^-$		G	J$^{\pi}$: L(p,p′)=3.
5891[&]	3$^-$,4$^-$		J V	XREF: V(5910). J$^{\pi}$: L(^{3}He,d)=0 from 7/2$^-$.
5919 *5*	5,6$^+$		G	J$^{\pi}$: L(p,p′)=5,6.
5953 *5*	2$^+$		G J S	XREF: J(5945). J$^{\pi}$: L(p,p′)=2.
5960 *5*			G	
5996 *5*	3$^-$		G J L	XREF: Others: AA XREF: J(5992)AA(5990). J$^{\pi}$: L(p,p′)=3.
6026 *6*	+		GH J	J$^{\pi}$: L(^{3}He,d)=1 from 7/2$^-$.
6035.3 *12*			G I	
6055 *5*	2$^+$		G	J$^{\pi}$: L(p,p′)=2.
6065 *7*			GH	XREF: H(6069).
6106 *6*	0$^+$		E G J S	XREF: E(6100)J(6089)S(6130). J$^{\pi}$: L(^{3}He,n)=0.
6137.0[a] *10*	2$^+$		G M	J$^{\pi}$: L(p,p′)=2. Excitation in (γ,γ').
6153 *8*	2$^+$		GH	J$^{\pi}$: L(t,p)=2.
6164 *12*	3$^-$		G V	XREF: V(6160). J$^{\pi}$: L(α,α')=3.
6175 *7*	2$^+$		G	XREF: Others: AD XREF: AD(6180). J$^{\pi}$: L(p,p′)=2.
6193 *6*	+		G J	J$^{\pi}$: L(^{3}He,d)=1 from 7/2$^-$.
6205.4 *12*			G I	
6210 *10*			G	
6220 *6*			G	
6233 *10*	+		G J	J$^{\pi}$: L(^{3}He,d)=1 from 7/2$^-$.
6243 *5*	3$^-$		G	J$^{\pi}$: L(p,p′)=3.
6252 *6*			G	
6272 *6*			G	
6293 *7*			G	
6324 *10*			G S	XREF: S(6330).
6349 *5*	+		G J	XREF: J(6364). J$^{\pi}$: L(^{3}He,d)=1 from 7/2$^-$.
6356.6 *12*	(9$^+$)		D	J$^{\pi}$: $\gamma(\theta)$ in (HI,xnγ).
6365.3[p] *11*	(10$^+$)		D	J$^{\pi}$: $\gamma(\theta)$ in (HI,xnγ).
6375.4 *12*			G I	XREF: G(6372).
6381.0 *10*	(6$^+$)		D	J$^{\pi}$: From $\gamma(\theta)$ in (HI,xnγ).
6389.9[a] *5*	1$^+$	0.069[o] eV *7*	G J LM	XREF: J(5790). J$^{\pi}$: 1 from excitation in (γ,γ'), PI=− ruled out by L(^{3}He,d)=1 from 7/2$^-$.
6392 *10*	3$^-$		G	J$^{\pi}$: L(p,p′)=3.
6426 *5*			G	
6437 *10*			G	

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[m]	XREF	Comments
6453.4[q] *4*	9^+	0.14 ps *+9−8*	D	J^π: $\gamma(\theta)$ in (HI,xnγ), M1+E2 γ to 8^+.
6462.4[a] *5*	1	0.074[o] eV *7*	G M	J^π: From excitation in (γ,γ').
6482 *5*	5,6^+		G	J^π: L(p,p′)=5,6.
6493[e] *10*	2^+		G J S	XREF: Others: AD XREF: J(6500)AD(6490). J^π: L(p,p′)=2. L(^{3}He,α)=0 from $3/2^-$.
6495.5[a] *5*	1	0.131[o] eV *9*	M	J^π: From excitation in (γ,γ').
6541 *10*	3^-		G V	J^π: L(α,α')=3.
6568 *10*			G	
6580 *5*			G J N	XREF: J(6610)N(6600).
6637 *5*			G J	XREF: J(6625).
6678 *5*	+		E G J	XREF: E(6670). J^π: L(^{3}He,n)=0, L(^{3}He,d)=1 from $7/2^-$.
6700[g] *20*	−			XREF: Others: AD J^π: L(^{3}He,α)=2 from $3/2^-$.
6704 *5*	5,6^+		G J	XREF: J(6720). J^π: L(p,p′)=5.
6752.0[a] *5*	1^+	0.089[o] eV *10*	J M S V	XREF: J(6760)S(6740)V(6760).
6795.4 *12*	3^-		G I O	XREF: G(6786). J^π: L(p,p′)=3.
6810 *30*	2^+		G J	XREF: Others: AA, AD XREF: J(6814)AA(6800)AD(6790). J^π: L(p,p′)=2.
6871 *5*	5^-		G	J^π: L(p,p′)=5.
6894[&]	+		J	J^π: L(^{3}He,d)=1 from $7/2^-$.
6928[&]	+		J	J^π: L(^{3}He,d)=1 from $7/2^-$.
6956 *5*	5,6^+		G	J^π: L(p,p′)=5,6.
6993 *5*	3^-		G J S	J^π: L(p,p′)=3.
7014.5[a] *4*	1	0.210[o] eV *30*	M	
7030[b] *10*	1^+		J N	XREF: J(6993). J^π: Dipole excitation in (e,e′). PI=− ruled out by L(^{3}He,d)=1 from $7/2^-$.
7090.8[a] *5*	1^+	0.062[o] eV *11*	G J M	J^π: from excitation in (γ,γ').
7100[f]	3^-		N V	J^π: L(α,α')=L(e,e′)=3.
7140[i] *7*	+		G N	J^π: M1 excitation in (e,e′). L(p,p′)=4.
7166.2[a] *5*	+	0.054[o] eV *11*	J MN	XREF: N(7170). J^π: M1 excitation in (e,e′). L(^{3}He,d)=1 from $7/2^-$.
7217 *10*	2^+		G J	XREF: J(7210). J^π: L(p,p′)=2.
7223[&]	+		J	J^π: L(^{3}He,d)=1 from $7/2^-$.
7237.9[q] *6*	10^+	0.16 ps *+15−8*	D	J^π: From $\gamma(\theta)$ in (HI,xnγ), M1+E2 γ to 9^+.
7260[b] *10*	+		J N	J^π: L(^{3}He,d)=1+3 from $7/2^-$, but M1, (M2) excitation in (e,e′).
7278 *10*	4^+		G J S	XREF: J(7273)S(7290). J^π: L(p,p′)=4.
7310[&]	+		J	J^π: L(^{3}He,d)=1+3 from $7/2^-$.
7322[&]	+		J	J^π: L(^{3}He,d)=1 from $7/2^-$.
7342[i] *7*	1^+		G J N	XREF: J(7350)N(7340). J^π: M1 excitation in (e,e′). L(p,p′)=2.
7368.8[a] *5*	1^+	0.229[o] eV *18*	J M	J^π: 1 from excitation in (γ,γ'), PI=− ruled out by L(^{3}He,d)=1 from $7/2^-$.
7376 *10*	5^-		G	J^π: L(p,p′)=5.
7395 *10*	5^+		J	XREF: Others: AA

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[m]	XREF	Comments
				XREF: J(7400)AA(7390). Jπ: L(α,^{2}He)=5,7, L(^{3}He,d)=1 from 7/2$^-$. E(level): From average of values in (^{3}He,d) and (α,^{2}He).
7401.6 *15*	(12$^+$)		D	Jπ: From (HI,xnγ), γ to (10$^+$).
7403.2[a] *5*	1	0.107[o] eV *15*	M	B(M1)=0.069 *10*, B(E1)=0.76×10^{-5} *11*.
7409 *10*	3$^-$		G O	Jπ: L(p,p′)=3.
7450[‡h] *50*	0$^+$,2$^+$		E	Jπ: L(^{3}He,n)=0+2.
7458 *10*	5,6$^+$		G	Jπ: L(p,p′)=5,6.
7482 *10*	3$^-$		G	Jπ: L(p,p′)=3.
7487	+		J	Jπ: L(^{3}He,d)=1 from 7/2$^-$.
7524.1[a] *5*	1$^+$[j]	0.400[o] eV *28*	g j MN	XREF: N(7520). Jπ: L(p,p′)=0.
7560[b] *20*	+		g j N S	XREF: g(7540)j(7536)S(7570). Jπ: from L(^{3}He,d)=1 from 7/2$^-$.
7585 *10*	3$^-$		G J	Jπ: L(p,p′)=3.
7590	+		J	Jπ: L(^{3}He,d)=1+3 from 7/2$^-$.
7679 *10*	5,6$^+$		G J	XREF: J(7686). Jπ: L(p,p′)=5,6, L(^{3}He,d)=1+3 from 7/2$^-$.
7700[b] *10*	1$^+$		N	Jπ: M1 excitation in (e,e′).
7731.9[a] *5*	1$^-$[j]	0.960[o] eV *24*	J M	B(E1)=5.96×10^{-5} *40*. $\Gamma^2_{\gamma 0}/\Gamma$=1.75 eV *32* (1979Ku14).
7738 *10*	3$^-$		G	Jπ: L(p,p′)=3.
7750	+		J	XREF: Others: AA XREF: J(7729). Jπ: L(^{3}He,d)=1 from 7/2$^-$, L(α,^{2}He)=5,7.
7760[&]	+		J	Jπ: L(^{3}He,d)=1 from 7/2$^-$.
7810[c]	−			XREF: Others: AG Jπ: L(α,t)=4.
7820 *10*	1$^+$		G J	XREF: J(7815). Jπ: M1 excitation in (e,e′).
7823[&] *10*	3$^-$		G	Jπ: L(p,p′)=3.
7854[i] *7*	4$^+$		G J N S	XREF: G(7848)N(7860)S(7870). Jπ: L(p,p′)=4. L(^{3}He,d)=1 from 7/2$^-$.
7865.1[a] *5*	1$^+$	0.435[o] eV *27*	M	
7889.0[a] *5*	1	0.480[o] eV *45*	M	Jπ: from excitation in (γ,γ′).
7893 *10*	4$^+$		G J	XREF: J(7905). Jπ: L(p,p′)=4. L(^{3}He,d)=1 from 7/2$^-$.
7897.4[a] *5*	1$^-$[j]	3.38[o] eV *17*	M	Jπ: π based on asymmetries for different g.s. dipole transition in (γ,γ′).
7900[b]	3$^-$		N V	Jπ: L(e,e′)=3.
7920[&]	+		J	Jπ: L(^{3}He,d)=1 from 7/2$^-$.
7930[‡] *50*	+		E J	XREF: J(7967). Jπ: L(^{3}He,n)=0, L(^{3}He,d)=1 from 7/2$^-$.
7967 *10*	3$^-$		G	Jπ: L(p,p′)=3.
8010	+		G J	XREF: Others: AG XREF: J(7967). Jπ: L(^{3}He,d)=1 from 7/2$^-$, L(α,t)=4 from 7/2$^-$.
8015.4[a] *4*	1	0.260[o] eV *59*	M	B(M1)=0.131 *30*, B(E1)=1.45×10^{-5} *33*.
8022 *10*	2$^+$		G J	Jπ: L(p,p′)=2 and L(^{3}He,d)=1 from 7/2$^-$.
8083	+		J MN	XREF: N(8080). Jπ: L(^{3}He,d)=1 from 7/2$^-$.
8087[&] *9*	3$^-$		G	Jπ: L(p,p′)=3.

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[m]	XREF	Comments
8091.3[a] 5	1	0.734[o] eV 44	M	J^π: from excitation in (γ,γ').
8100 20	8^-		N	J^π: M8 excitation in (e,e′).
8121 10	+		G J	XREF: J(8130). J^π: L(^{3}He,d)=1 from 7/2$^-$, L(p,p′)=0.
8179.3[a] 4	1^+	0.90[o] eV 18	G J M O	XREF: J(8183). J^π: L(p,p′)=0.
8190[c]	+			XREF: Others: AG J^π: L(α,t)=4 from 7/2$^-$.
8213 10	0^+		G	J^π: L(p,p′)=0.
8216.4[q] 9	11^+	0.24 ps +17−9	D J	XREF: J(8234). J^π: from $\gamma(\theta)$ in (HI,xnγ), M1+E2 γ to 10$^+$, E2 γ to 9$^+$.
8250[&]	+		J	J^π: L(^{3}He,d)=1+3 from 7/2$^-$.
8281[e] 10	3^-		G	J^π: L(p,p′)=3.
8283	+		J	J^π: L(^{3}He,d)=1 from 7/2$^-$.
8337[e] 10	(4^+)		G J	XREF: J(8330). J^π: L(p,p′)=4,5, L(^{3}He,d)=1+3 from 7/2$^-$.
8350[&]	+		J	J^π: L(^{3}He,d)=1 from 7/2$^-$.
8374[e] 10	3^-		G	J^π: L(p,p′)=3.
8390[b] 10	+		J N	XREF: J(8371). J^π: L(^{3}He,d)=1 from 7/2$^-$.
8412[e] 10	+		G J O	XREF: J(8400). J^π: L(^{3}He,d)=1 from 7/2$^-$.
8420[c]	6^-		N	XREF: Others: AG XREF: N(8450). J^π: L(α,t)=4, M6 excitation in (e,e′).
8451[&]	+		J	J^π: L(^{3}He,d)=1 from 7/2$^-$.
8457 10	3^-		G	J^π: L(p,p′)=3.
8505 10	3^-		G	J^π: L(p,p′)=3.
8569 10	0^+		G J S	XREF: J(8579)S(8580). J^π: L(p,p′)=0.
8600[b] 10	3^-		N	B(E3)↑=0.0022 3 (1964Be32) J^π: L(e,e′)=3.
8617 10			G J	XREF: J(8614). J^π: L(p,p′)=2,3,4. L(^{3}He,d)=1+3 from 7/2$^-$.
8679[e] 10	3^-		G	J^π: L(p,p′)=3.
8710[‡h] 50	+		E J N	XREF: J(8700)N(8690). J^π: L(^{3}He,n)=0+2. L(^{3}He,d)=1+3 from 7/2$^-$, D, E2 excitation in (e,e′).
8728 10	3^-		G	J^π: L(p,p′)=3.
8765.9[a] 5	1	0.441[o] eV 37	M	J^π: from excitation in (γ,γ').
8778 10	3^-		G	J^π: L(p,p′)=3.
8790 10	2		N	J^π: Q excitation in (e,e′).
8827 10			G	
8860 10	1^+,(2^-)		N	J^π: M1,(M2) excitation in (e,e′).
8890 20	1^+,(2^-)		N S	J^π: M1,(M2) excitation in (e,e′).
8940 20	$(8^-,6^-)$		N	J^π: (M8,M6) excitation in (e,e′).
8958.4[a] 5	1	0.233[o] eV 36	M	J^π: from excitation in (γ,γ').
9004[i] 9	1^+	[o]	G N	XREF: G(9020). J^π: M1 excitation in (e,e′). L(p,p′)=0.
9050[&] 10	1^+,(2^-)		N	J^π: M1,(M2) excitation in (e,e′).
9080 20	(8^-)		N	J^π: (M8) excitation in (e,e′).
9140.3[aq] 5	1^+[j]	2.65[o] eV 15	G MN	B(M1)=0.90 5.

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[m]	XREF	Comments
				J^π: M1 excitation in (e,e′). L(p,p′)=0, 1^+ in (γ,γ').
9200[@]	5^-			XREF: Others: AA J^π: L(α,^{2}He)=5.
9211.9[a] *5*	1^+	2.11[o] eV *14*	G MN	XREF: G(9221)N(9210). J^π: M1 excitation in (e,e′).
9245[e] *10*	1^+		G	J^π: L(p,p′)=0.
9327.0[a] *5*	1^+[k]	0.746[o] eV *80*	G N	J^π: M1 excitation in (e,e′).
9370 *20*	1^+,2^-		N	J^π: M1,M2 excitation in (e,e′).
9429.0[a] *5*	1^+	0.95[o] eV *11*	G MN	XREF: G(9440). J^π: M1 excitation in (e,e′).
9438.5[q] *9*	$12^{(+)}$		D N	J^π: from (HI,xnγ), γ to 10^+.
9450 *20*	8^-		N	XREF: Others: AG XREF: AG(9480). J^π: M8 excitation in (e,e′).
9470 *20*	1^+,2^+		N	J^π: M1, E2 excitation in (e,e′).
9580 *10*	0^+		E N	J^π: L(^{3}He,n)=0. But M1,(E1) excitation in (e,e′).
9612[i] *9*	1^+[k]		G N	XREF: G(9620). J^π: M1 excitation in (e,e′).
9660 *20*	8^-		N	XREF: Others: AG XREF: AG(9630). J^π: M8 excitation in (e,e′).
9724[i] *9*	1^+[k]		G MN	XREF: G(9740)M(9736)N(9720). J^π: M1 excitation in (e,e′).
9787[a] *3*	1^-[j]		M	J^π: π based on asymmetries for different g.s. dipole transition in (γ,γ').
9830 *10*	1^+		N	J^π: M1 excitation in (e,e′).
9878[i] *9*	1^+[k]		E G N	XREF: E(9870)G(9870)N(9880). J^π: M1 excitation in (e,e′).
9910 *20*	8^-		N	J^π: M8 excitation in (e,e′).
9981[a] *3*	$(^-)$		M	J^π: π: based on asymmetrics for different g.s. dipole transition, see (γ,γ'),(pol γ,γ').
10008[i] *9*	1^+[k]		G N	XREF: G(10000)N(10010).
10110 *20*	(8^-)		N	XREF: Others: AG XREF: AG(10130). J^π: (M8) excitation in (e,e′).
10130 *20*	1,2^-		NO	J^π: D,M2 excitation in (e,e′).
10161.3[q] *12*	(13^+)		D	J^π: from $\gamma(\theta)$ in (HI,xnγ), E2 γ to 11^+.
10180 *10*	2^-		N	J^π: M2 excitation in (e,e′).
10240 *20*	1		N	J^π: E1, (M1) excitation in (e,e′).
10270 *20*	1,(2^-)		N	J^π: D, (M2) excitation in (e,e′).
10300 *20*			N	J^π: M2, M3,E3 excitation in (e,e′).
10330 *20*	6^-		N	XREF: Others: AG XREF: AG(10280). J^π: M6 excitation in (e,e′).
10340 *20*	1		N	J^π: D excitation in (e,e′).
10380[i] *14*	1^+[k]		G N	
10433[a] *4*	1^+		MN	J^π: M1 excitation in (e,e′).
10464 *9*	1^+[k]		G N	XREF: G(10480)N(10460). J^π: M1 excitation in (e,e′).
10500 *20*	1		N	J^π: D excitation in (e,e′).
10510 *20*	$(^-)$		N	J^π: (M8, M6) excitation in (e,e′).
10604[i] *12*	1^+[k]		G N	XREF: G(10580)N(10610).
10710 *10*	1		N	J^π: D excitation in (e,e′).

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	XREF	Comments
10760 *10*	$6^+,8^+$	N	XREF: Others: AA XREF: AA(10750). J^π: L(α,^{2}He)=6,8.
10790 *9*	1^+[k]	G N	J^π: M1 excitation in (e,e′).
10800 *20*	$(^-)$	N	J^π: (M8,M6) excitation in (e,e′).
10820 *10*	$1^+,(2^-)$	N	J^π: M1, (M2) excitation in (e,e′).
10927[a] *3*	$1^+,2^-$	MN	XREF: N(10920). J^π: M1, M2 excitation in (e,e′).
10970 *20*	0^+[k]	G	J^π: L(p,p′)=0.
11000 *20*	8^-	N	J^π: M8 excitation in (e,e′).
11070 *10*	1	N	J^π: D excitation in (e,e′).
11140 *10*	0^+[k]	G N	XREF: G(11120). J^π: L(p,p′)=0.
11160 *20*	$(1^+),2$	N	J^π: (M1), Q excitation in (e,e′).
11170 *20*	8^-	N	XREF: Others: AG J^π: M8 excitation in (e,e′). L(α,t)=4.
11229 *3*		I	
11256.5 *7*		e I	XREF: e(11280).
11264.9 *4*	$+$[l]	e I	XREF: Others: AA T=3 XREF: e(11280)AA(11260). IAS (^{52}V g.s.). Some authors identify 11256.5 state as g.s. IAS. However, from a comparison of relative M1 transition rates from 11264.9 state with Gamow-Teller β decay matrix elements for ^{52}V g.s. 1973Fa12 concluded that most of the IAS strength lies in the 11265 state. The 11256 state might still be a fragment of the g.s. IAS.
11270 *20*	8^-	NO	J^π: M8 excitation in (e,e′).
11274.6[d] *6*	$+$[l]	e I	T=3 XREF: e(11280). Identified as fragment of IAS (^{52}V 23 keV).
11291.1[d] *10*		I	XREF: Others: AD
11330 *20*	$(1^+),2^-$	N	J^π: (M1), M2 excitation in (e,e′).
11370 *20*	8^-	N	XREF: Others: AG XREF: AG(11350). J^π: M8 excitation in (e,e′). L(α,t)=4.
11400.0[d] *4*	4^+	I	T=3 Identified by 1974Ro44 as IAS (^{52}V 148 keV, 4^+). J^π: From γ(theta) in (p,γ).
11402[i] *9*	1^+	G N	XREF: G(11410)N(11400). J^π: M1 excitation in (e,e′). L(p,p′)=0.
11510 *10*	2^-	N	J^π: M2 excitation in (e,e′).
11550 *20*	8^-	N	J^π: M8 excitation in (e,e′).
11570 *20*	$(1^+),2$	N	J^π: (M1),Q excitation in (e,e′).
11610 *10*	2	N	J^π: Q excitation in (e,e′).
11656[d] *3*	$1^+,2^-$	I N	XREF: N(11650). J^π: M1, M2 excitation in (e,e′).
11660 *20*	8^-	N	XREF: Others: AG J^π: M8 excitation in (e,e′).
11691.8[d] *4*		I N	T=3 IAS (^{52}V 437 keV, 2^+).
11713[d] *3*		I	
11725[d] *3*		I	
11745[d] *3*		I	

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	XREF	Comments
11765[a] 3		M	
11770 20	8⁻	N	XREF: Others: AG XREF: AG(11790). J^π: M8 excitation in (e,e′).
11780 20	(1⁺),2⁻	N	J^π: (M1),M2 excitation in (e,e′).
11837[a] 3		M	
11880 20	8⁻	N	J^π: M8 excitation in (e,e′).
11960 20	8⁻	N	J^π: M8 excitation in (e,e′).
12034.8[d] 4	−	I N	XREF: Others: AG XREF: AG(12050). J^π: L(α,t)=4 from 7/2⁻.
12041.8[d] 4	4+[l]	I	T=3 IAS (^{52}V 793 keV, 3⁺).
12050	−		XREF: Others: AG J^π: L(α,t)=4.
12099.9 4	4+[l]	I	T=3 IAS (^{52}V 846 keV, 4⁺).
12130 20	(8⁻,6⁻)	N	J^π: (M8,M6) excitation in (e,e′).
12240 20	6⁻	N	J^π: M6 excitation in (e,e′).
12260[@]	6⁺,8⁺		XREF: Others: AA J^π: L(α,^{2}He)=6,8.
12500[c]	−		XREF: Others: AG J^π: L(α,t)=4 from 7/2⁻.
12560 20	1+[k]	G	XREF: Others: AG
12665[d] 6	3⁺	I	T=3 IAS (^{52}V 1419 keV, 3⁺)?
12730 20	−	N	XREF: Others: AG XREF: AG(12700). J^π: L(α,t)=4 from 7/2⁻.
12734[d] 6		I	T=3 IAS (^{52}V 1493 keV, 7⁺)?
12794.8 7	4+[l]	I	T=3 IAS (^{52}V 1559 keV, 4⁺)?
12900 20	1+[k]	G	
12977[d] 6	−[l]	I	XREF: Others: AG T=3 XREF: AG(13010). J^π: L(α,t)=4 from 7/2⁻. IAS (^{52}V 1733 keV, 3⁻,4⁻)?
12994[d] 6	+[l]	I	IAS (^{52}V 1760 keV, 3⁺)?
13038[d] 6	+[l]	I	IAS (^{52}V 1843 keV, +)?
13220 20	8⁻	N	J^π: M8 excitation in (e,e′).
13319[d]		I	
13393[d]	6⁻	I N	J^π: M6 excitation in (e,e′).
13419[d]	0⁺	E I	T=3 J^π: L(^{3}He,n)=0.
13570 20	6⁻	N	J^π: M6 excitation in (e,e′).
13580[g] 20	(1,2)⁻		XREF: Others: AD J^π: L(^{3}He,α)=0 from 3/2⁻.
13630[‡] 10	0⁺	E	T=3 J^π: L(^{3}He,n)=0. IAS (^{52}V 2396 keV, 0⁺, (1⁺))?

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Adopted Levels, Gammas (continued)

^{52}Cr Levels (continued)

E(level)[†]	J^π	XREF	Comments
13710 *20*	6^-	N	J^π: M6 excitation in (e,e′).
13950[‡] *50*		E	
14030 *20*	6^-	N	J^π: M6 excitation in (e,e′).
14110[‡] *20*	2^+	E	T=3 J^π: L(^{3}He,n)=2. IAS (^{52}V 2881 keV, +)?
14340 *20*	6^-	N	J^π: M6 excitation in (e,e′).
14430 *20*	8^-	N	XREF: Others: AG XREF: AG(11470). J^π: M8 excitation in (e,e′).
15270 *20*	6^-	N	XREF: Others: AG XREF: AG(15280). J^π: M6 excitation in (e,e′). L(α,t)=4.
15482[c] *7*	8^-	N	XREF: Others: AG T=3 J^π: M8 excitation in (e,e′).
16400 *20*	6^-	N	J^π: M6 excitation in (e,e′).
16690 *20*	(8^-)	N	J^π: (M8) excitation in (e,e′).

[†] Levels connected by gammas are from least squares fit, others from ^{52}Cr(p,p′) for E(level)<8830 keV and from ^{52}Cr(e,e′) for E(level)>8830 keV, except as noted.
[‡] From ^{50}Ti(^{3}He,n).
[#] From ^{50}Cr(t,p).
[@] From ^{50}Cr(α,^{2}He).
[&] From ^{51}V(^{3}He,d).
[a] From ^{52}Cr(γ,γ'),(pol γ,γ').
[b] From ^{52}Cr(e,e′).
[c] From ^{51}V(α,t).
[d] From ^{51}V(p,γ).
[e] From ^{52}Cr(p,p′).
[f] From ^{52}Cr(α,α').
[g] From ^{53}Cr(^{3}He,α).
[h] Close doublet; not resolved in (^{3}He,n) tof spectra, but separated in angular distribution procedure.
[i] From weighted average of values in ^{52}Cr(e,e′) and ^{52}Cr(p,p′).
[j] Dipole transition in ^{52}Cr(γ,γ'),(pol γ,γ').
[k] Based on $\sigma(\theta)$, DWIA calculations in ^{52}Cr(p,p′).
[l] IAS in ^{51}V(p,γ) E=res.
[m] From (HI,xnγ), DSAM, except as noted.
[n] From (n,n′γ).
[o] Partial decay width into ground state in ^{52}Cr(γ,γ'),(pol γ,γ').
[p] Band(A): g.s. Band.
[q] Band(B): Band based on 5^+.

$\gamma(^{52}Cr)$

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[d]	δ[d]	Comments
1434.091	2^+	1434.068[b] *14*	100	0.0	0^+	E2[@]		B(E2)(W.u.)=10.3 *3*
2369.630	4^+	935.538[b] *11*	100	1434.091	2^+	E2[@]		B(E2)(W.u.)=1.0×10^{-11} *+3−6*
2646.9	0^+	1212.8 *6*	100	1434.091	2^+	E2		E_γ: from (p,p′γ).
2767.767	4^+	398.08[#] *9*	1.76 *14*	2369.630	4^+	E2[@]		B(E2)(W.u.)=45 *13*
								I_γ: other: 1.36 *17* in ^{52}V β^- decay.
		1333.649 *17*	100 *1*	1434.091	2^+	E2[@]		B(E2)(W.u.)=6.0 *16*
2964.786	2^+	1530.67[‡] *1*	100[‡] *4*	1434.091	2^+	M1+E2	−6.25 *15*	B(M1)(W.u.)=0.00036 *8*; B(E2)(W.u.)=13 *3*
		2965[‡] *1*	0.9[‡] *6*	0.0	0^+	E2[#]		B(E2)(W.u.)=0.005 *4*
3113.858	6^+	346.02 *4*	1.09 *1*	2767.767	4^+	E2		B(E2)(W.u.)=2.58 *10*
		744.233 *13*	100.0 *9*	2369.630	4^+	E2		B(E2)(W.u.)=5.14 *19*
3161.74	2^+	1727.53[‡] *7*	100[‡] *5*	1434.091	2^+	M1+E2	−0.18 *7*	B(M1)(W.u.)=0.107 *23*; B(E2)(W.u.)=2.6 *21*
		3161.8[‡] *1*	10.0[‡] *14*	0.0	0^+	E2		B(E2)(W.u.)=0.40 *10*
3415.32	4^+	647.47 *6*	100 *5*	2767.767	4^+	M1+E2[@e]	0.22[@e] *8*	B(M1)(W.u.)=0.24 *7*; B(E2)(W.u.)=6.E+1 *5*
		766.0[#f] *10*		2646.9	0^+			The γ′s placement is highly suspect because ΔJ=4.
		1045.73[b] *4*	17 *5*	2369.630	4^+			
		1981.12 *4*	8.5 *8*	1434.091	2^+	[E2]		B(E2)(W.u.)=0.42 *13*
3472.25	3^+	704.6[‡] *2*	100	2767.767	4^+	M1+E2	−0.14 *6*	B(M1)(W.u.)=0.0059 *7*; B(E2)(W.u.)=0.5 *5*
								I_γ: From (n,n′γ).
		2038.0[‡] *2*	44.2 *12*	1434.091	2^+			I_γ: From (n,n′γ).
3615.924	5^+	200.58 *4*	1.80 *5*	3415.32	4^+			
		502.06 *5*	5.0 *5*	3113.858	6^+			
		848.18 *5*	78.9 *7*	2767.767	4^+	M1[@]		B(M1)(W.u.)=0.006 *3*
		1246.278 *15*	100.0 *14*	2369.630	4^+			
3771.72	2^+	2337.44[c] *19*	100[‡] *14*	1434.091	2^+	M1+E2	−0.20 *8*	B(M1)(W.u.)=0.15 *5*; B(E2)(W.u.)=2.4 *20*
		3771.7[‡] *2*	26[‡] *6*	0.0	0^+	[E2]		B(E2)(W.u.)=1.5 *5*
3947.5	2^+	1578[&]		2369.630	4^+			
3951.2	2^+	3951[‡] *1*	[‡]	0.0	0^+			
4015.51	5^+	399.57 *5*	46.9 *18*	3615.924	5^+			I_γ: other: 33.3 *5* in (HI,xnγ).
		600.16 *5*	100 *3*	3415.32	4^+	M1[@]		B(M1)(W.u.)=0.062 *+20−28*
		901.89 *18*	11.3 *11*	3113.858	6^+			
		1247.88 *9*	97 *10*	2767.767	4^+	M1[@]		B(M1)(W.u.)=0.0067 *+23−31*
		1645.82 *4*	12.1 *8*	2369.630	4^+			
4039.1	4^+	566.8[@]	100[@]	3472.25	3^+			
4563.0	3^-	791[&]		3771.72	2^+			
		3129[‡] *1*		1434.091	2^+			
4584.0	(6^+)	1470.1[@] *7*	100[@]	3113.858	6^+			
4627.32	4^+	2257.42 *19*	100	2369.630	4^+			

$^{52}_{24}Cr_{28}$-13

Adopted Levels, Gammas (continued)

$\gamma(^{52}Cr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[d]	δ[d]	Comments
4750.31	8^+	1636.4[@] *2*	100[@]	3113.858	6^+	E2[@]		B(E2)(W.u.)=5.E+1 *+7−5*
4805.96	6^+	790.0[@] *3*	100[@] *8*	4015.51	5^+	(M1+E2)[@e]	−0.16[@e] *5*	B(M1)(W.u.)=(0.062 *+19−37*); B(E2)(W.u.)=(6 *+4−5*)
		1189.7[@]	20[@] *5*	3615.924	5^+			
		1693.9[@] *6*	23[@] *3*	3113.858	6^+			
4815.69	$1^+,2^+$	3381.5[‡] *1*	100[‡] *20*	1434.091	2^+			
		4815.4[‡] *2*	100[‡] *16*	0.0	0^+			
5098.6	1	3664.5[a] *5*	79[a] *22*	1434.091	2^+			
		5098.3[a] *5*	100[a]	0.0	0^+			
5213.7	1	5213.4[a] *5*	100[a]	0.0	0^+			
5396.9	7^+	590.9[@] *3*	100[@] *6*	4805.96	6^+	M1+E2[@e]	−0.27[@e] *6*	B(M1)(W.u.)=0.6 *+4−6*; B(E2)(W.u.)=2.9×10^2 *+22−28*
		1381.5[@] *5*	15.2[@] *16*	4015.51	5^+	E2[@]		B(E2)(W.u.)=9 *+6−8*
5526.0	1	5525.7 *5*		0.0	0^+			
5544.7	(1^+)	5544.4[a]	100[a]	0.0	0^+			
5633.4	(8^+)	1049.4[@] *8*	100[@]	4584.0	(6^+)			
5824.7	8^+	427.9[@] *3*	100[@]	5396.9	7^+	M1(+E2)[@e]	−0.03[@e] *4*	α(K)=0.00166; α(L)=0.00016 B(M1)(W.u.)=(0.28 *+12−17*); B(E2)(W.u.)=(3 *+9−3*)
6137.0	2^+	6136.6[a]	100[a]	0.0	0^+			
6356.6	(9^+)	725.5[@f] *12*	100[@]	5633.4	(8^+)			
6365.3	(10^+)	1615.0[@] *10*	100[@]	4750.31	8^+			
6381.0	(6^+)	2765.0[@]	100	3615.924	5^+			
6389.9	1^+	6389.5[a] *5*	100[a]	0.0	0^+			
6453.4	9^+	628.9[@] *5*	35[@] *18*	5824.7	8^+	M1+E2[@e]	+0.22[@e] *+15−8*	B(M1)(W.u.)=0.13 *11*; B(E2)(W.u.)=4.E+1 *+6−4*
		1056.0[@] *10*	26[@] *2*	5396.9	7^+			
		1702.9[@] *5*	100[@] *5*	4750.31	8^+	M1+E2[@e]	−0.04[@e] *+7−3*	B(M1)(W.u.)=0.020 *+12−13*; B(E2)(W.u.)=0.02 *+9−2*
6462.4	1	6462.0[a] *5*	100[a]	0.0	0^+			
6495.5	1	6495.1[a] *5*	100[a]	0.0	0^+			
6752.0	1^+	6751.5[a] *5*	100[a]	0.0	0^+			
7014.5	1	5580.5[a] *5*	24[a] *6*	1434.091	2^+			
		7013.6[a] *5*	100[a]	0.0	0^+			
7090.8	1^+	7090.3[a] *5*	100[a]	0.0	0^+			
7166.2	$^+$	7165.7[a] *5*	100[a]	0.0	0^+			
7237.9	10^+	784.5[@] *5*	100[@] *12*	6453.4	9^+	M1+E2[@e]	−0.06[@e] *+3−5*	B(M1)(W.u.)=0.19 *+10−18*; B(E2)(W.u.)=2 *+3−2*
		883.7[@f] *10*	28[@] *3*	6356.6	(9^+)			
		1413.6[@f] *10*	8[@] *4*	5824.7	8^+	[E2]		B(E2)(W.u.)=2.9 *+21−29*
		1606.0[@f] *20*	15[@] *4*	5633.4	(8^+)	[E2]		B(E2)(W.u.)=2.9 *+17−28*
7368.8	1^+	7368.2[a] *5*	100[a]	0.0	0^+			
7401.6	(12^+)	1036.3[@]	100	6365.3	(10^+)	(E2)[@]		

$\gamma(^{52}Cr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[d]	δ[d]	Comments
7403.2	1	7402.6[a] *5*	100[a]	0.0	0^+			
7524.1	1^+	7523.5[a] *5*	100[a]	0.0	0^+			
7731.9	1^-	7731.3[a] *5*	100[a]	0.0	0^+			
7865.1	1^+	7864.5[a] *5*	100[a]	0.0	0^+			
7889.0	1	7888.4[a] *5*	100[a]	0.0	0^+			
7897.4	1^-	7896.8[a] *5*	100[a]	0.0	0^+			
8015.4	1	6580.9[a] *5*	54[a] *16*	1434.091	2^+			
		8014.6[a] *5*	100[a]	0.0	0^+			
8091.3	1	8090.6[a] *5*	100[a]	0.0	0^+			
8179.3	1^+	6744.8[a] *5*	326[a] *50*	1434.091	2^+			E_γ: if 8179.2 level energy is correct, then $E\gamma$ should be 6744.8, not 6740.8 as listed in table I of 2013Pa38.
		8178.5[a] *5*	100[a]	0.0	0^+			
8216.4	11^+	978.5[@] *5*	97[@] *9*	7237.9	10^+	M1+E2[@e]	+0.10[@e] *+5−8*	B(M1)(W.u.)=0.048 *+19−35*; B(E2)(W.u.)=1.1 *+12−11*
		1763.3[@] *10*	100[@] *11*	6453.4	9^+	E2[@]		B(E2)(W.u.)=6.1 *+25−44*
8765.9	1	8765.1[a] *5*	100[a]	0.0	0^+			
8958.4	1	8957.6[a] *5*	100[a]	0.0	0^+			
9140.3	1^+	9139.4[a] *5*	100[a]	0.0	0^+			
9211.9	1^+	9211.0[a] *5*	100[a]	0.0	0^+			
9327.0	1^+	9326.1[a] *5*	100[a]	0.0	0^+			
9429.0	1^+	9428.1[a] *5*	100[a]	0.0	0^+			
9438.5	$12^{(+)}$	1222.4[@] *8*	100[@] *5*	8216.4	11^+			
		2200.0[@] *10*	16.8[@] *11*	7237.9	10^+			
10161.3	(13^+)	721.3[@] *10*	4.7[@] *6*	9438.5	$12^{(+)}$			
		1943.6[@] *7*	100.0[@] *17*	8216.4	11^+	E2[@]		
11256.5		8291	100	2964.786	2^+			
		8488	85	2767.767	4^+			
11264.9	+	7648	<9	3615.924	5^+			
		7792	<5	3472.25	3^+			
		7850	39 *7*	3415.32	4^+	(M1+E2)[@e]	+0.06[@e] *9*	
		8150	25 *9*	3113.858	6^+			
		8299	<5	2964.786	2^+			
		8496	11 *7*	2767.767	4^+			
		8895	100 *16*	2369.630	4^+	(M1+E2)[@e]	+0.9[@e] *+10−5*	
		9830	34 *5*	1434.091	2^+	(M1+E2)[@e]	−0.30[@e] *6*	
11274.6	+	4479	72 *12*	6795.4	3^-			
		4899	24 *8*	6375.4				
		5069	36 *12*	6205.4				
		5239	20 *8*	6035.3				
		5549	100 *12*	5725.3	+			
		7258	60 *12*	4015.51	5^+			
		7326	24 *8*	3947.5	2^+			

$^{52}_{24}Cr_{28}$-15

γ(^{52}Cr) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[d]	δ[d]	Comments
11274.6	+	7859	8 *4*	3415.32	4+	(M1+E2)[@e]	+0.47[@e] *10*	
		8904	56 *8*	2369.630	4+	(M1+E2)[@e]	+0.19[@e] *10*	
11291.1		9856	100	1434.091	2+			
11400.0	4+	5836	61 *5*	5563.5	+			
		5953	29 *5*	5446.4	4+			
		7360		4039.1	4+			
		7384		4015.51	5+			
		7783	26 *3*	3615.924	5+			
		7985	21 *3*	3415.32	4+			
		8285	5 *3*	3113.858	6+			
		9030	100 *5*	2369.630	4+	(M1+E2)[@e]	0.5[@e] *2*	δ: from (p,γ), see 1974Ro44.
11691.8		5302	33 *3*	6389.9	1+			
		6027	23 *3*	5664.4	(2)+			
		6245	53 *3*	5446.4	4+			
		6637	13 *7*	5054.3	4+			
		6854		4841.3	1+,1−,2+			
		6883		4805.96	6+			
		6949	37 *3*	4742.3	0+			
		7652		4039.1	4+			
		7676		4015.51	5+			
		8219	30 *7*	3472.25	3+			
		8277	7 *3*	3415.32	4+			
		8529	13 *3*	3161.74	2+			
		8726	27 *7*	2964.786	2+			
		8923	10 *3*	2767.767	4+			
		9322	27 *3*	2369.630	4+			
		10257	100 *7*	1434.091	2+			
12034.8	−	6471	22 *4*	5563.5	+			
		6588	22 *4*	5446.4	4+			
		7404	48 *4*	4627.32	4+			
		8562	17 *9*	3472.25	3+			
		8620	100 *9*	3415.32	4+			
		9069	17 *9*	2964.786	2+			
		9266	74 *4*	2767.767	4+			
		9665	78 *4*	2369.630	4+			
		10600	48 *4*	1434.091	2+			
12041.8	4+	6595	42 *4*	5446.4	4+			
		7233	19 *4*	4805.96	6+			
		8569	46 *4*	3472.25	3+			
		8627	19 *4*	3415.32	4+			
		8879	62 *4*	3161.74	2+			
		9076	7 *4*	2964.786	2+			
		9273	31 *4*	2767.767	4+			

$^{52}_{24}Cr_{28}$-16

$\gamma(^{52}Cr)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f
12041.8	4^+	9672	100 *4*	2369.630	4^+
		10607	54 *4*	1434.091	2^+
12099.9	4^+	6239	39 *9*	5860.5	$^+$
		6362	39 *9*	5737.5	(4^+)
		6653	30 *9*	5446.4	4^+
		7002	13 *4*	5098.6	1
		7469	30 *4*	4611	$(3,4)^+$
		8060	30 *4*	4039.1	4^+
		8084	13 *2*	4015.51	5^+
12099.9	4^+	8152	22 *4*	3947.5	2^+
		8483	26 *4*	3615.924	5^+
		8627	17 *3*	3472.25	3^+
		8685	52 *9*	3415.32	4^+
		9331	35 *4*	2767.767	4^+
		9730	100 *9*	2369.630	4^+
12794.8	4^+	9178	81	3615.924	5^+
		10424	100	2369.630	4^+

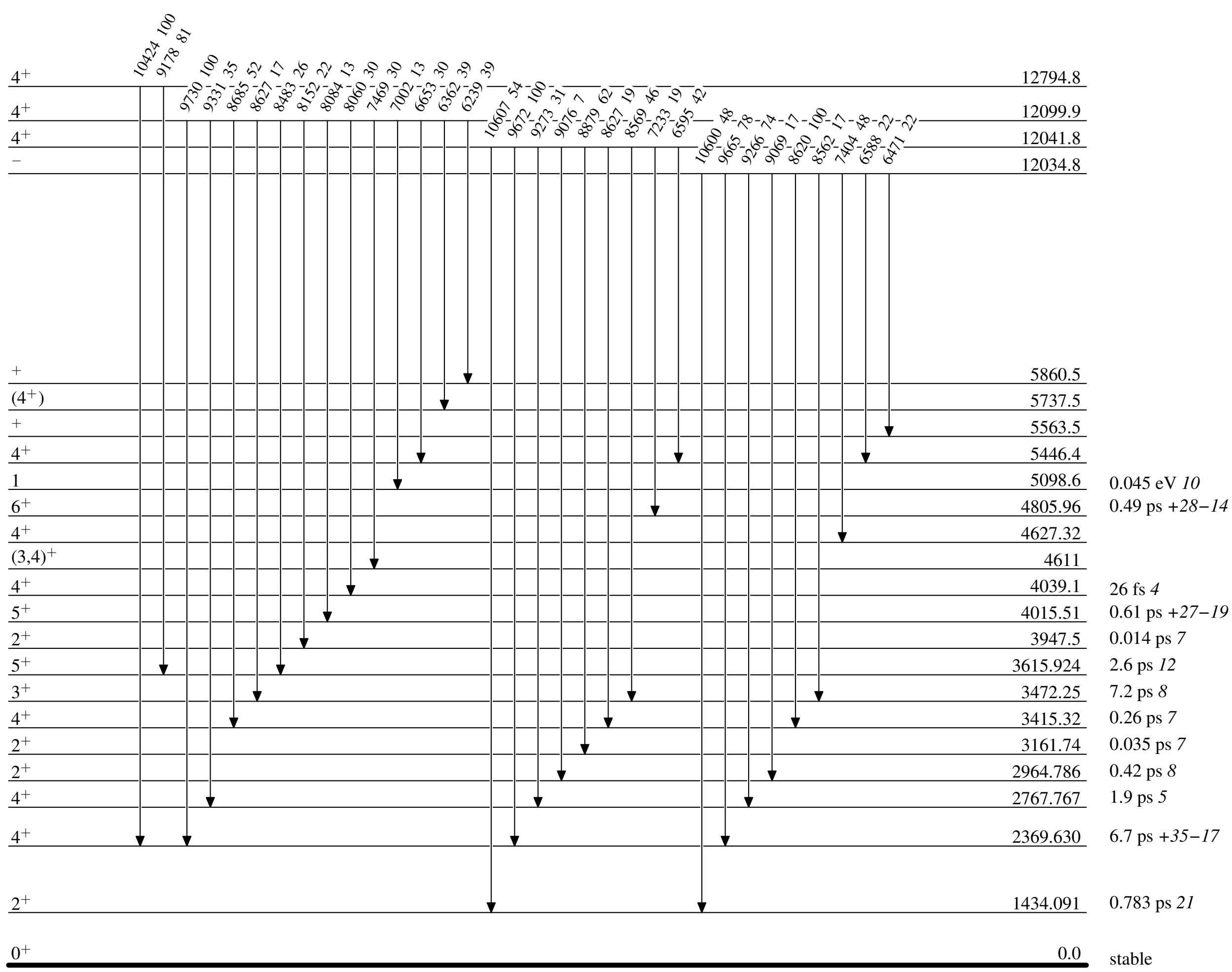
† $E\gamma$<4 MeV from ^{52}Mn ε decay (5.591 d), $E\gamma$>4 MeV from ^{51}V(p,γ), except as noted.
‡ From ^{52}Mn ε decay (21.1 min).
# From ^{52}V β^- decay.
@ From (HI,xnγ).
& From ^{51}V(^{3}He,dγ).
a From ^{52}Cr(γ,γ'),(pol γ,γ').
b From weighted average of values in ^{52}Mn ε decay (5.591 d) and ^{52}V β^- decay.
c From weighted average of values in ^{52}Mn ε decay (21.1 min) and ^{52}V β^- decay.
d From $\gamma\gamma(\theta)$ in ^{52}Cr(p,p$'\gamma$), except as noted.
e From ^{51}V(p,γ).
f Placement of transition in the level scheme is uncertain.

$^{52}_{24}Cr_{28}$-17

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

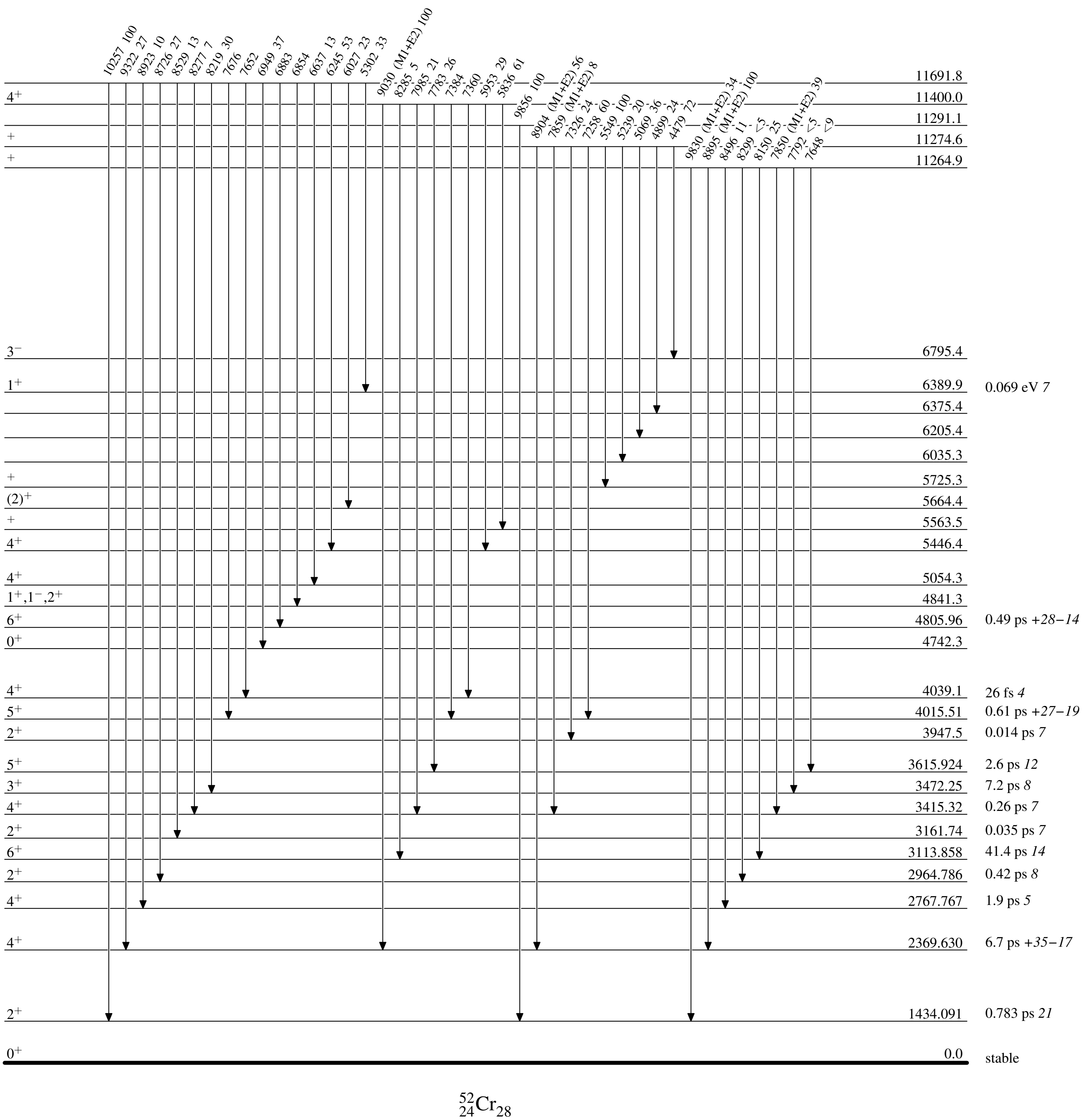


$^{52}_{24}Cr_{28}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



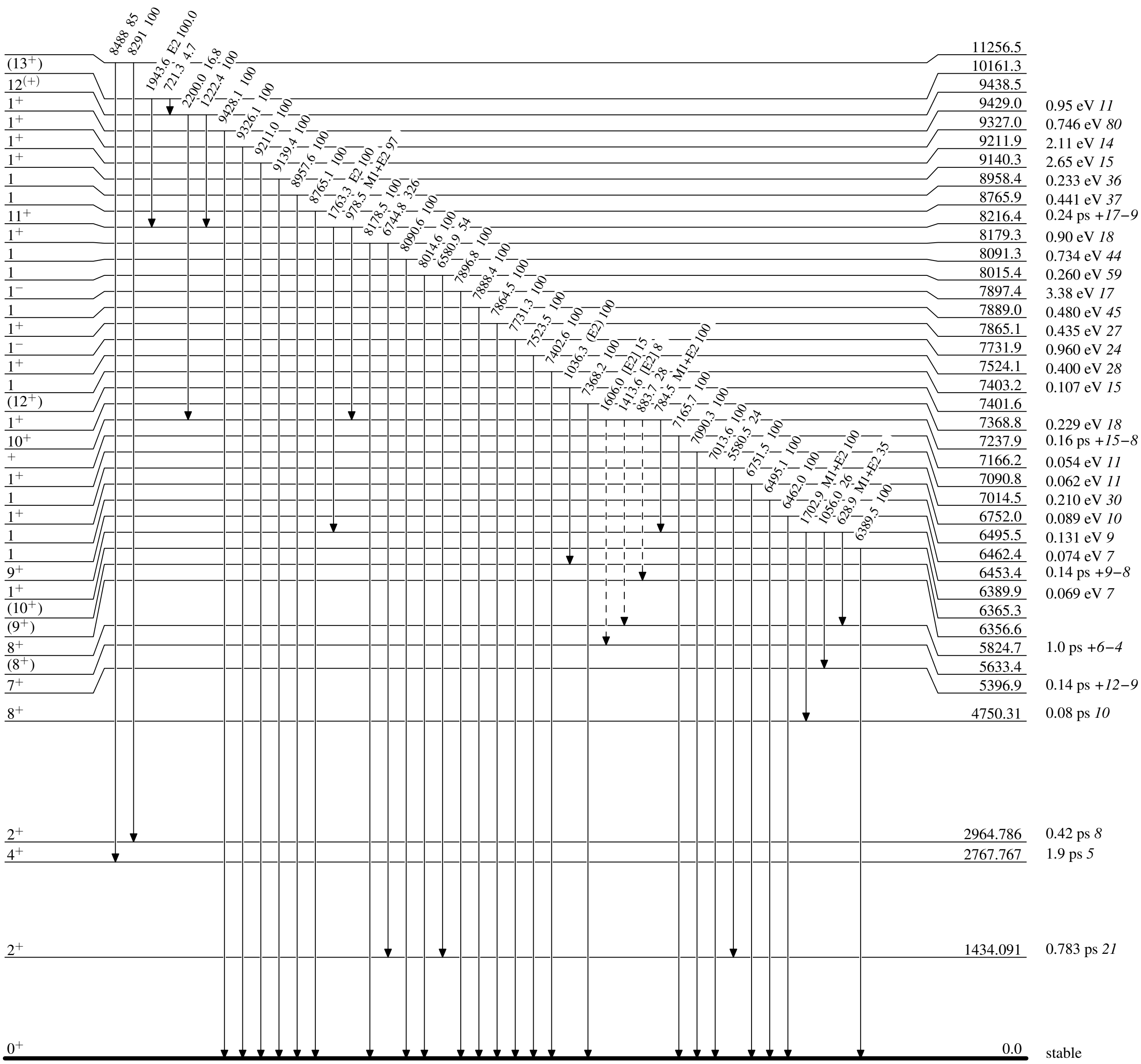
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)

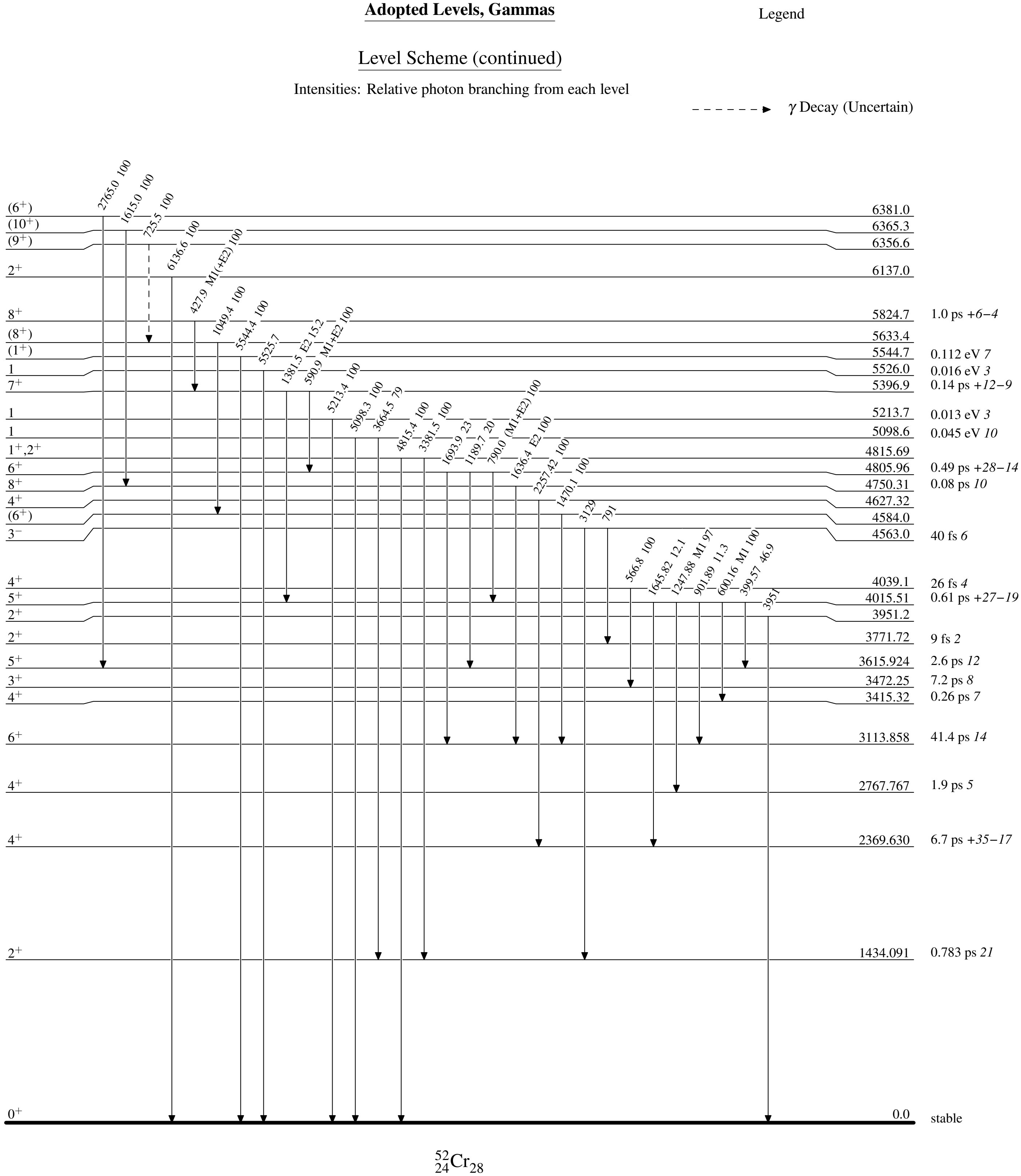


$^{52}_{24}\mathrm{Cr}_{28}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

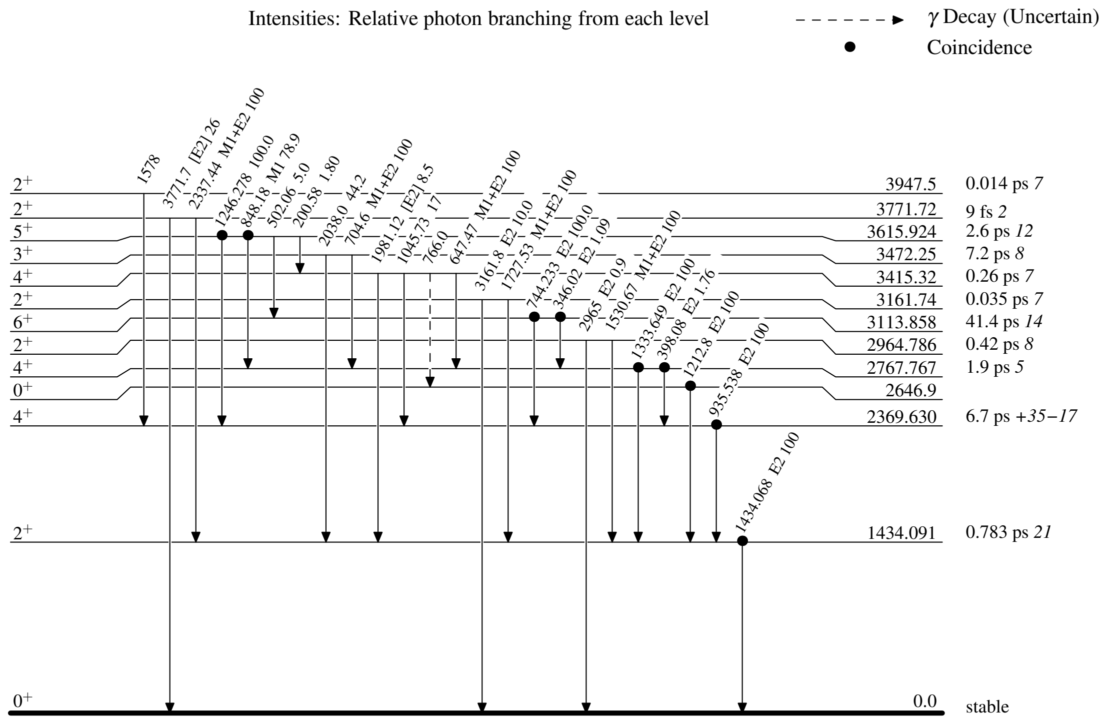


Adopted Levels, Gammas

Level Scheme (continued)

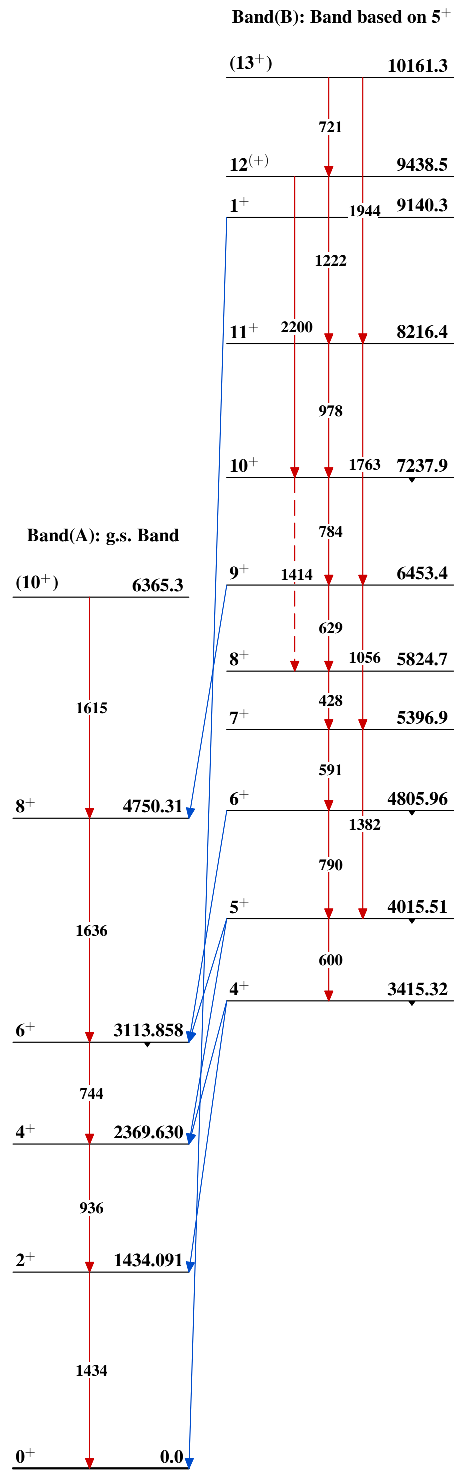
Intensities: Relative photon branching from each level

Legend



$^{52}_{24}Cr_{28}$

Adopted Levels, Gammas



$^{52}_{24}Cr_{28}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yang Dong, Huo Junde	NDS 121, 1 (2014)	20-Jun-2014

Q(β^-)=−1377.2 *10*; S(n)=9719.12 *12*; S(p)=12373 *3*; Q(α)=−7927.9 *6* 2012Wa38

Additional information 1.

^{54}Cr Levels

Cross Reference (XREF) Flags

A	^{54}V β^- decay	K	^{54}Cr(n,n′γ)	U	^{57}Fe(n,$\alpha\gamma$)
B	^{54}Mn ε decay	L	^{54}Cr(p,p′),(p,p′γ)	V	^{53}Cr(n,γ) E=res
C	^{48}Ca(^{9}Be,3nγ)	M	^{52}Cr(α,^{2}He)	W	^{54}Cr(pol d,d′), (pol d,d′γ)
D	^{50}Ti(^{6}Li,d)	N	^{55}Mn(n,d)	X	^{12}C(^{48}Ca,α2nγ)
E	^{50}Ti(^{16}O,^{12}C)	O	Coulomb excitation	Y	^{56}Fe(μ^-,νpnγ)
F	^{51}V(α,p),(α,pγ)	P	^{55}Mn(μ^-,nγ)	Z	^{238}U(^{64}Ni,Xγ)
G	^{52}Cr(t,p)	Q	^{54}Cr(α,α')	Others:	
H	^{53}Cr(n,γ),(pol n,γ) E=th	R	^{55}Mn(p,2p)	AA	Cu(K$^-$,x rayγ)
I	^{53}Cr(d,p)	S	^{55}Mn(d,^{3}He)		
J	^{54}Cr(n,n′)	T	Fe(μ^-,xnypγ)		

E(level)[†]	J$^\pi$[&]	T$_{1/2}$[a]	XREF	Comments
0.0[f]	0$^+$	stable	ABCDEFGHIJKLMNOPQRSTUVWXYZ	XREF: Others: AA
834.855[f] *3*	2$^+$	8.0 ps *3*	ABCDEFGHIJKL NOP STUVWXYZ	XREF: Others: AA Q=−0.21 *8* (1975To06); μ=+1.68 *11* (2001Wa36) B(E2)↑=0.087 *4* (2001Ra27) XREF: G(838)N(900). μ,Q: Compiled by 2011StZZ. T$_{1/2}$: from Coulomb excitation. Other:>4.2 ps ((α,p),(α,pγ)).
1823.93[f] *7*	4$^+$	1.9 ps *6*	A CDEFGHIJ L NOP S UV X Z	XREF: N(1800). T$_{1/2}$: from DSAM in (^{9}Be,3nγ). Other: 2.4 ps *+12−8* (α,p),(α,pγ).
2619.68 *4*	2$^+$	78[c] fs *15*	A FGHI L S VW	XREF: I(2627)L(2615). T$_{1/2}$: other: 0.11 ps *+3−2* (α,p),(α,pγ).
2829.62 *5*	0$^+$	0.15 ps *+6−4*	EFGHI KL V	XREF: E(2900)I(2835)K(2776).
3074.07 *6*	2$^+$	7.1[c] fs *4*	A D FGHI L N S V	XREF: D(3080)N(3000). T$_{1/2}$: other:<0.017 ps (α,p),(α,pγ).
3159.57 *10*	4$^+$	0.24 ps *+5−4*	A DEFGHI L S V	XREF: I(3167).
3222.45[f] *13*	6$^+$	0.49[b] ps *14*	A C FG L S X Z	J$^\pi$: from L(t,p)=(6), $\gamma(\theta)$ in (^{9}Be,3nγ), 1398γ E2 to 4$^+$. T$_{1/2}$: other: 0.40 ps *+8−7* (α,p),(α,pγ).
3393.41 *7*	(1$^-$,2$^-$)	15[c] fs *+14−7*	FGHI L V	XREF: I(3389). T$_{1/2}$: other:<19 fs (α,p),(α,pγ). J$^\pi$: (E1) γ from (1$^-$); γ to 0$^+$.
3436.88 *6*	2$^+$	8[c] fs *3*	A EFGHI L S V	XREF: I(3442)S(3429). T$_{1/2}$: other:<10 fs (α,p),(α,pγ).
3468?			F	E(level): from (α,p) see 1979SmZQ.
3514[‡] *7*			F L	
3655.23 *20*	4$^+$	<6 fs	A EFGHI L S V	XREF: E(3630)I(3662).
3720.03 *5*	1$^+$,2$^+$	16.6[c] fs *14*	FgHI l V	XREF: g(3710)I(3726). J$^\pi$: from (pol n,γ) and $\gamma\gamma(\theta)$ in (n,γ), L(d,p)=1. T$_{1/2}$: other:<30 fs (α,p),(α,pγ).
3785.71 *12*	(4)$^+$	>2.8 ps	A F L S V	J$^\pi$: fed in β^- decay by a log *ft*=5.69 branch from

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Adopted Levels, Gammas (continued)

^{54}Cr Levels (continued)

E(level)[†]	J^{π}[&]	$T_{1/2}$[a]	XREF	Comments
				$J^{\pi}=3^+$ and 594γ to 6^+.
				$T_{1/2}$: from ^{51}V(α,p),(α,pγ).
3798.54 *12*	4^+	51 fs *+9−8*	A FG I L V	XREF: I(3805).
3861.02 *5*	2^+		FGHi l V	XREF: G(3862).
3870.4 *5*		>28 fs	F i l	$T_{1/2}$: from ^{51}V(α,p),(α,pγ).
3925.55 *7*	2^+		GH S V	J^{π}: from (n,γ) E=res and $\gamma\gamma(\theta)$.
3927.69 *8*	2^+		FGHI L V	XREF: F(3934)I(3937).
3987.42 *21*		>42 fs	F Mn	XREF: M(3980)n(4000).
				$T_{1/2}$: from ^{51}V(α,p),(α,pγ).
4012.90 *7*	0^+	1.4[c] fs *+21−14*	GHI L n V	XREF: I(4020)n(4000).
4043.3[h] *3*	5^+	28 fs *+13−10*	C eF L S X	XREF: e(4060).
				J^{π}: 820γ to 6^+, cascade of the yrast levels; 2221γ to 4^+.
				$T_{1/2}$: other: $T_{1/2}$<0.12 ps from (^{9}Be,3nγ).
4083.25 *6*	$(2,3,4)^+$		A e GHI L V	XREF: e(4060)I(4092).
				J^{π}: fed in β^- decay by a log *ft*=4.81 from 3^+.
4126.0 *7*	2[e]		V	
4127.05 *7*	3^-		GHI L S V	XREF: I(4134).
				J^{π}: from L(t,p)=3 and (pol n,γ). But L(d,p)=3 from 1964Le03 and log *ft*=5.69 from JPi=3^+ give π=+.
4190.8 *5*	2^+		E G I L V	XREF: E(4200)L(4195).
				J^{π}: From L(t,p)=2.
4217.51 *5*	$(2)^+,3^+$[e]		A HI L V	XREF: I(4225).
4239.1 *5*	2^+		G i L S V	XREF: G(4248)i(4250)L(4241).
				J^{π}: from L(t,p)=2+3 for E=4248 *11*.
4256.4 *4*	2^+		gHi L V	XREF: g(4248)i(4250)L(4257).
				J^{π}: from L(t,p)=2+3 for E=4248 *11*.
4380.95 *11*	(2^-)		GHI L V	XREF: L(4377).
				E(level): unresolved doublet in (t,p) based on fit to $\sigma(\theta)$.
				J^{π}: from L(t,p)=(1+3), but L(d,p)=1, π=+.
4451.0 *5*	4^+		A G L V	XREF: L(4454).
4458.4 *5*	$1^+,(2^+)$[e]		V	
4570.8 *9*	$(2^-),3^-$[e]		E L S V	XREF: E(4550)L(4572)S(4551).
4583[#] *5*	0^+		G L	J^{π}: From L(t,p)=0.
4618 *17*			I L S	E(level): from weighted average of 4619 *7* (p,p′),(p,p′γ) and 4617 *10* (d,p).
4633.60 *14*	2^+		GHI L V	XREF: L(4632).
				J^{π}: from L(t,p)=2, but L(d,p)=2, π=−.
4681.5[f] *3*	$(8)^+$	0.55[b] ps *7*	C X Z	J^{π}: from E2 γ to 6^+.
4689.1 *6*			X	
4740[@]			E	
4844.7 *9*	2−[e]		I L V	
4865 *5*	$(1^-,4^+)$		G L S	E(level): from weighted average of 4864 *7* (p,p′),(p,p′γ) and 4866 *5* (t,p). Unresolved doublet in (t,p) based on fit to $\sigma(\theta)$.
				J^{π}: from L(t,p)=(1+4).
4872.36 *6*	2+[d]		HI L V	
4921[‡] *7*			LM	XREF: M(4900).
4936 *7*			I L S	XREF: I(4940)L(4934).
				E(level): from weighted average of 4934 *7* (p,p′),(p,p′γ) and 4940 *10* (d,p).
4997[‡] *7*			L	

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Adopted Levels, Gammas (continued)

^{54}Cr Levels (continued)

E(level)[†]	J$^{\pi}$[&]	$T_{1/2}$[a]	XREF	Comments
5017[‡] *10*			L	
5026[‡] *10*			L	
5062 *10*	4$^+$		G L	XREF: G(5065)L(5060). J$^{\pi}$: From L(t,p)=4. E(level): from weighted average of 5060 *10* (p,p′),(p,p′γ) and 5065 *12* (t,p).
5085.8 *4*	(7)		X	J$^{\pi}$: from DCO and 1043γ to 5$^+$.
5113.6 *5*	2$^+$[e]		G I L V	
5156[‡] *10*			L	
5189.62 *12*	2$^+$[d]		GHI L S V	
5191[‡] *10*			L r	XREF: r(5200).
5215[‡] *10*			L r	XREF: r(5200).
5226.56 *11*	2$^+$[d]		HI L V	XREF: I(5230)L(5225).
5268.46 *10*	2$^+$[d]		H L V	
5275 *7*	2$^+$		G I L	E(level): from weighted average of 5275 *10* (p,p′),(p,p′γ) 5275 *10* (t,p), and 5275 *9* (d,p).
5291.3 *6*	2$^+$[e]		l V	XREF: l(5290). J$^{\pi}$: γ′s to 2$^+$, 0$^+$.
5294.23 *9*	1$^+$,2$^+$		HI l V	XREF: I(5298)l(5290). J$^{\pi}$: from (pol n,γ) and $\gamma\gamma(\theta)$, L(d,p)=1.
5321[‡] *10*			L S	XREF: S(5310).
5345.7 *12*	2[e]		L V	XREF: L(5350).
5363.9[h] *3*	7$^+$	0.24[b] ps *6*	C E g X	XREF: E(5370)g(5366). J$^{\pi}$: from 682.3γ to 8$^+$, 2141.3γ to 6$^+$, 1319.9γ to 5$^+$.
5387 *10*			g I	XREF: g(5366).
5458 *6*	2$^+$		G I	J$^{\pi}$: From L(t,p)=2. E(level): from weighted average of 5459 *10* (t,p) and 5457 *6* (d,p).
5498 *10*			I	
5557 *7*	4$^+$		G I	XREF: G(5555)I(5560). J$^{\pi}$: From L(t,p)=4. E(level): from weighted average of 5560 *10* (t,p) and 5555 *7* (d,p).
5586.94 *7*	1$^+$,2$^+$[e]		GHI S V	XREF: G(5583)I(5590)S(5574).
5670 *10*			I	
5698 *10*			I	
5740 *10*			I	
5771 *12*			S	
5797.9[g] *5*	(7)		I X	J$^{\pi}$: from 1110.9γ to 8$^+$, 2575.7γ to 6$^+$.
5821.50 *13*			HI M	XREF: I(5829)M(5840).
5856.4 *4*			HI	XREF: I(5863).
5893 *10*	($^+$)		I	J$^{\pi}$: from L(d,p)=(1).
5935 *10*			E I	XREF: E(5950).
5981 *10*			I S	XREF: S(5983).
6113 *10*			I S	XREF: S(6104).
6120 *10*			I	
6142.31 *17*			HI	XREF: I(6148).
6193 *10*			I	
6212 *10*			I	
6255 *10*			I	
6289 *10*			I	
6316.39 *9*			HI	
6350 *10*			I	
6374 *10*			I	

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Adopted Levels, Gammas (continued)

^{54}Cr Levels (continued)

E(level)[†]	J^{π}[&]	$T_{1/2}$[a]	XREF	Comments
6391 *10*			I	
6421 *10*			I	
6446.2 *6*	(9)		X	J^{π}: from 1360.4γ to (7).
6510 *10*			I	
6525 *10*			I	
6556 *10*			I	
6585 *10*			I	
6617.8[h] *4*	9^+		X	J^{π}: from 1254.2γ to 7^+ and 1936.0γ to $(8)^+$.
6633 *10*			I	
6658 *10*			I	
6678 *10*			I	
6699[#] *10*			E G	
6719.52 *79*	(10^+)	<0.10[b] ps	C I	
6726.2[f] *7*	$(10)^+$		X	J^{π}: from 2042γ E2 to $(8)^+$.
6743 *10*			I	
6780 *10*			I	
6814 *10*			I	
6831 *10*			I	
6875 *10*			I	
6899 *10*			I	
6941 *10*			I	
6960 *10*			I	
6991[#] *10*			E G I	XREF: E(7000)I(7000).
7050 *10*			I	
7084 *10*			I	
7103 *10*			I	
7127 *10*			I	
7159 *10*			I	
7174 *10*			I	
7199 *10*			I M	
7235.3 *4*	(9)		X	J^{π}: from 6184γ to 9^+, 1870γ to 7^+, 2555γ to 8^+.
7292.1[g] *5*	(9)		X	J^{π}: from 1494γ to (7), 1928γ to 7^+, 2611γ to 8^+.
7370			I	
7400[@]			E	
7590	$(^-)$		I	J^{π}: from L(d,p)=(0).
7850[@]			E	
7895.0 *9*	(10)		X	J^{π}: from 3213γ to 8^+.
8236.9[h] *6*	(11^+)		X	J^{π}: 1513γ to 10^+, 1619γ to 9^+.
8300[@]			E	
8500[@]			E	
8825.4[f] *8*	(12^+)		X	J^{π}: from 2101γ to $(10)^+$.
8859.1[g] *7*	(10)		X	J^{π}: from 1567γ to (9).
8990	+		M	J^{π}: from unresolved L=8 and L=6 in $(\alpha,^2He)$.
9154.4 *6*	(11)		X	J^{π}: from 1919γ to (9), 2430γ to 10^+.
9300[@]			E	
9420	+		M	J^{π}: from unresolved L=8 and L=6 in $(\alpha,^2He)$.
9634.4 *9*	(12^+)		X	J^{π}: from 2910γ to 10^+.
9971.8[h] *8*	(13^+)		X	J^{π}: from 1735γ to (11^+).
10551.6 *11*	(11^+)		X	J^{π}: from 3827γ to 10^+.
11115.9[g] *9*	(11)		X	J^{π}: from 2257γ to (10).
11785.9[h] *9*	(15^+)		X	J^{π}: from 1814γ to 13^+.
12539.9 *11*	(13)		X	J^{π}: from 3385γ to (11).

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Adopted Levels, Gammas (continued)

^{54}Cr Levels (continued)

† Energies for states connected by γ-rays from using least-squares fits. Others from (d,p), except as noted.
‡ From (p,p′),(p,p′γ).
# From (t,p).
@ From (^{16}O,^{12}C).
& From L values reported in (t,p), except as noted.
a From DSAM in (α,pγ), except as noted.
b From (^{9}Be,3nγ).
c From (n,γ),(pol n,γ) E=th.
d From (n,γ),(pol n,γ) E=th and $\gamma\gamma(\theta)$ measurements.
e Deduced both from primary and secondary gamma-rays in (n,γ) E=res.
f Band(A): Yrast sequence from (^{48}Ca,α2nγ).
g Band(B): Cascade based on (7) from (^{48}Ca,α2nγ).
h Band(C): Cascade based on (5^{+}) from (^{48}Ca,α2nγ).

γ(^{54}Cr)

E_i(level)	J^π_i	E_γ[†]	I_γ[b]	E_f	J^π_f	Mult.[†]	δ[†]	Comments
834.855	2$^+$	834.848 *3*	100	0.0	0$^+$	E2		B(E2)(W.u.)=14.4 *6* E_γ: from ^{54}Mn ε decay. Mult.: from ax(exp) In ^{54}Mn ε decay.
1823.93	4$^+$	989.08[@] *2*	100	834.855	2$^+$	E2		B(E2)(W.u.)=26 *9*
2619.68	2$^+$	1784.65[@] *9*	100 *1*	834.855	2$^+$	M1+E2	−0.53 *18*	B(M1)(W.u.)=0.037 *9*; B(E2)(W.u.)=7 *4*
		2619.57 *9*	4.3 *3*	0.0	0$^+$	[E2]		B(E2)(W.u.)=0.20 *4*
2829.62	0$^+$	1994.56 *5*	100	834.855	2$^+$	E2		B(E2)(W.u.)=10 *+3−4*
3074.07	2$^+$	2239.07 *5*	100.0 *5*	834.855	2$^+$	M1+E2	0.02 *5*	B(M1)(W.u.)=0.273 *16*; B(E2)(W.u.)=0.05 *+23−5*
		3073.95 *18*	1.1 *2*	0.0	0$^+$	[E2]		B(E2)(W.u.)=0.26 *5*
3159.57	4$^+$	1336.0[&] *3*	100[‡&] *7*	1823.93	4$^+$			
		2325.0[‡] *4*	69 *8*	834.855	2$^+$	[E2]		B(E2)(W.u.)=1.17 *+25−29*
3222.45	6$^+$	1398.63[‡] *13*	100[‡] *15*	1823.93	4$^+$	E2		B(E2)(W.u.)=18 *5*
3393.41	(1$^-$,2$^-$)	2558.45 *5*	100	834.855	2$^+$			
		3393.35 *7*	58 *5*	0.0	0$^+$			
3436.88	2$^+$	817.20 *7*	3.0 *4*	2619.68	2$^+$			
		2601.91 *8*	100 *6*	834.855	2$^+$	M1+E2	−0.11 *+12−16*	B(M1)(W.u.)=0.15 *6*; B(E2)(W.u.)=0.6 *+13−6*
3655.23	4$^+$	1831.27[‡] *19*	100[‡]	1823.93	4$^+$	M1		B(M1)(W.u.)>0.60 Mult.: from RUL.
3720.03	1$^+$,2$^+$	890.41 *2*	12 *1*	2829.62	0$^+$			
		1100.38 *6*	17 *1*	2619.68	2$^+$			
		3719.84 *7*	100.0 *5*	0.0	0$^+$			
3785.71	(4)$^+$	563.68[‡] *19*	42[‡] *2*	3222.45	6$^+$			
		626.56[‡] *27*	7[‡] *3*	3159.57	4$^+$			
		1961.53[‡] *11*	100[‡] *10*	1823.93	4$^+$			
3798.54	4$^+$	639.35[‡] *25*	80[‡] *10*	3159.57	4$^+$			
		1974.33[‡] *12*	100[‡] *22*	1823.93	4$^+$			
		2964.29[‡] *25*	78[‡] *20*	834.855	2$^+$	[E2]		B(E2)(W.u.)=1.2 *4*
3861.02	2$^+$	1241.36 *7*	100 *6*	2619.68	2$^+$			
		3026.05 *6*	60 *5*	834.855	2$^+$			
3870.4		1250.8[#] *5*		2619.68	2$^+$			

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Adopted Levels, Gammas (continued)

$\gamma(^{54}Cr)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[b]	E_f	J_f^π	Mult.[†]	Comments
3870.4		3034.6[#] *13*		834.855	2^+		
3925.55	2^+	205.62 *20*	17 *3*	3720.03	$1^+,2^+$		
		1095.7 *5*		2829.62	0^+		
		2101.1 *3*		1823.93	4^+		
		3090.63 *8*	100 *17*	834.855	2^+		
3927.69	2^+	3927.57 *9*	100	0.0	0^+		
3987.42		594.0[#] *2*	100[#]	3393.41	$(1^-,2^-)$		E_γ: not reported by 1980St04 in $^{51}V(\alpha,p),(\alpha,p\gamma)$.
4012.90	0^+	1394.3 *7*		2619.68	2^+		
		3177.93 *7*		834.855	2^+		
4043.3	5^+	820.4[a] *3*	100[a] *3*	3222.45	6^+		Additional information 2.
		2220.9[a] *6*	18.5[a] *11*	1823.93	4^+		Additional information 3.
4083.25	$(2,3,4)^+$	646.27[‡] *24*	4.9[‡] *9*	3436.88	2^+		
		923.29[‡] *20*	17.7[‡] *17*	3159.57	4^+		
		1009.25[‡] *16*	3.0[‡] *13*	3074.07	2^+		
		1463.51[‡] *9*	18.9[‡] *15*	2619.68	2^+		
		2259.35[‡] *11*	100[‡] *3*	1823.93	4^+		
4126.0	2	1052.0 *7*	100	3074.07	2^+		
4127.05	3^-	1508.24 *25*	46 *15*	2619.68	2^+		
		3292.11 *8*	100 *23*	834.855	2^+		
4190.8	2^+	3356.1 *5*		834.855	2^+		
		4189.8 *9*		0.0	0^+		
4217.51	$(2)^+,3^+$	1597.72 *4*	27 *18*	2619.68	2^+		
		2394.82[‡] *36*	76 *36*	1823.93	4^+		
		3382.96[‡] *18*	100 *20*	834.855	2^+		
4239.1	2^+	1619.8 *9*		2619.68	2^+		
		3403.9 *6*		834.855	2^+		
4256.4	2^+	3421.4 *4*		834.855	2^+		
		4256.2 *9*		0.0	0^+		
4380.95	(2^-)	3545.92 *13*	100	834.855	2^+		
4451.0	4^+	2627.00[‡] *42*	100[‡]	1823.93	4^+		
4458.4	$1^+,(2^+)$	4458.2 *5*	100	0.0	0^+		
4570.8	$(2^-),3^-$	2746.8 *9*	100	1823.93	4^+		
4633.60	2^+	1804.00 *14*		2829.62	0^+		
		2013.5 *4*		2619.68	2^+		
4681.5	$(8)^+$	1459.1[a] *4*	100[a]	3222.45	6^+	E2[a]	B(E2)(W.u.)=12.8 *17* Additional information 4. Mult.: from $\gamma(\theta)$ In $^{12}C(^{48}Ca,\alpha2n\gamma)$ and RUL.
4844.7	2^-	4009.7 *9*	100	834.855	2^+		
4872.36	2^+	745.37 *16*	5.7 *9*	4127.05	3^-		
		944.57 *19*	2.8 *9*	3927.69	2^+		
		946.80 *15*	4.7 *9*	3925.55	2^+		
		1435.49 *18*	21.79 *19*	3436.88	2^+		
		1712.4 *3*		3159.57	4^+		
		1798.22 *5*	23.6 *19*	3074.07	2^+		
		4872.27 *10*	100 *8*	0.0	0^+		
5085.8	(7)	1042.7[a] *4*	100[a]	4043.3	5^+		Additional information 5.
5113.6	2^+	4278.3 *6*		834.855	2^+		
		5113.9 *9*		0.0	0^+		
5189.62	2^+	1106.38 *10*		4083.25	$(2,3,4)^+$		
		2358.2 *10*		2829.62	0^+		
		5189.6 *14*		0.0	0^+		
5226.56	2^+	845.57 *12*		4380.95	(2^-)		

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Adopted Levels, Gammas (continued)

$\gamma(^{54}Cr)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[b]	E_f	J^π_f	Mult.[†]	Comments
5226.56	2^+	2066.99 *7*		3159.57	4^+		
		4390.7 *4*		834.855	2^+		
5268.46	2^+	1340.81 *10*		3927.69	2^+		
		1831.34 *17*		3436.88	2^+		
		4433.43 *21*		834.855	2^+		
		5268.3 *11*		0.0	0^+		
5291.3	2^+	4455.9 *9*		834.855	2^+		
		5291.3 *7*		0.0	0^+		
5294.23	$1^+,2^+$	2464.23 *19*	23 *8*	2829.62	0^+		
		2674.49 *11*	53 *5*	2619.68	2^+		
		4459.28 *21*	100 *13*	834.855	2^+		
5345.7	2	4510.6 *12*	100	834.855	2^+		
5363.9	7^+	278.3[a] *3*	2.9[a] *3*	5085.8	(7)		
		682.3[a] *3*	100[a] *10*	4681.5	$(8)^+$		Additional information 6.
		1319.9[a] *5*	25[a] *1*	4043.3	5^+		Additional information 7.
		2141.3[a] *6*	38[a] *2*	3222.45	6^+		Additional information 8.
5586.94	$1^+,2^+$	1460.10 *14*	22 *11*	4127.05	3^-		
		1503.62 *9*	33 *11*	4083.25	$(2,3,4)^+$		
		2967.05 *19*	94 *17*	2619.68	2^+		
		4751.83 *10*	100 *22*	834.855	2^+		
5797.9	(7)	1110.9[a] *4*	22.9[a] *15*	4689.1			Additional information 9.
		2575.7[a] *6*	100[a] *3*	3222.45	6^+		Additional information 10.
5821.50		2101.43 *12*	100	3720.03	$1^+,2^+$		
5856.4		5021.29 *34*	100	834.855	2^+		
6142.31		847.90 *17*	100 *12*	5294.23	$1^+,2^+$		
		2749.56 *36*	62 *25*	3393.41	$(1^-,2^-)$		
6316.39		2233.09 *6*	100	4083.25	$(2,3,4)^+$		
6446.2	(9)	1360.4[a] *4*	100[a]	5085.8	(7)		Additional information 11.
6617.8	9^+	1254.2[a] *4*	100[a] *4*	5363.9	7^+	[a]	Additional information 12.
		1936.0[a] *5*	47[a] *2*	4681.5	$(8)^+$		Additional information 13.
6719.52	(10^+)	2038.9 *8*	100	4681.5	$(8)^+$	E2	B(E2)(W.u.)>13 E_γ: From (^{9}Be,3nγ).
6726.2	$(10)^+$	2042.5[a] *5*	100[a]	4681.5	$(8)^+$	E2[a]	Additional information 14.
7235.3	(9)	617.6[a] *4*	56[a] *3*	6617.8	9^+		Additional information 15.
		1870.5[a] *5*	94[a] *3*	5363.9	7^+		Additional information 16.
		2554.9[a] *6*	100[a] *3*	4681.5	$(8)^+$		Additional information 17.
7292.1	(9)	1494.3[a] *4*	70[a] *4*	5797.9	(7)		Additional information 18.
		1927.9[a] *5*	31.1[a] *15*	5363.9	7^+		Additional information 19.
		2610.6[a] *6*	100[a] *4*	4681.5	$(8)^+$		Additional information 20.
7895.0	(10)	3213.4[a] *8*	100[a] *6*	4681.5	$(8)^+$		Additional information 21.
8236.9	(11^+)	1512.7[a] *5*	14.6[a] *11*	6726.2	$(10)^+$		
		1619.2[a] *5*	100[a] *4*	6617.8	9^+	[a]	Additional information 22.
8825.4	(12^+)	2101.2[a] *6*	100[a]	6726.2	$(10)^+$		Additional information 23.
8859.1	(10)	1567.0[a] *5*	100[a]	7292.1	(9)		Additional information 24.
9154.4	(11)	1919.0[a] *5*	41[a] *4*	7235.3	(9)		Additional information 25.
		2430.2[a] *6*	100[a] *4*	6726.2	$(10)^+$		Additional information 26.
9634.4	(12^+)	2910.2[a] *7*	100[a]	6726.2	$(10)^+$		Additional information 27.
9971.8	(13^+)	1734.8[a] *5*	100[a]	8236.9	(11^+)		Additional information 28.
10551.6	(11^+)	3827.3[a] *9*	100[a]	6726.2	$(10)^+$		Additional information 29.
11115.9	(11)	2256.7[a] *6*	100[a]	8859.1	(10)		Additional information 30.
11785.9	(15^+)	1814.1[a] *5*	100[a]	9971.8	(13^+)		Additional information 31.
12539.9	(13)	3385.4[a] *9*	100[a]	9154.4	(11)		Additional information 32.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

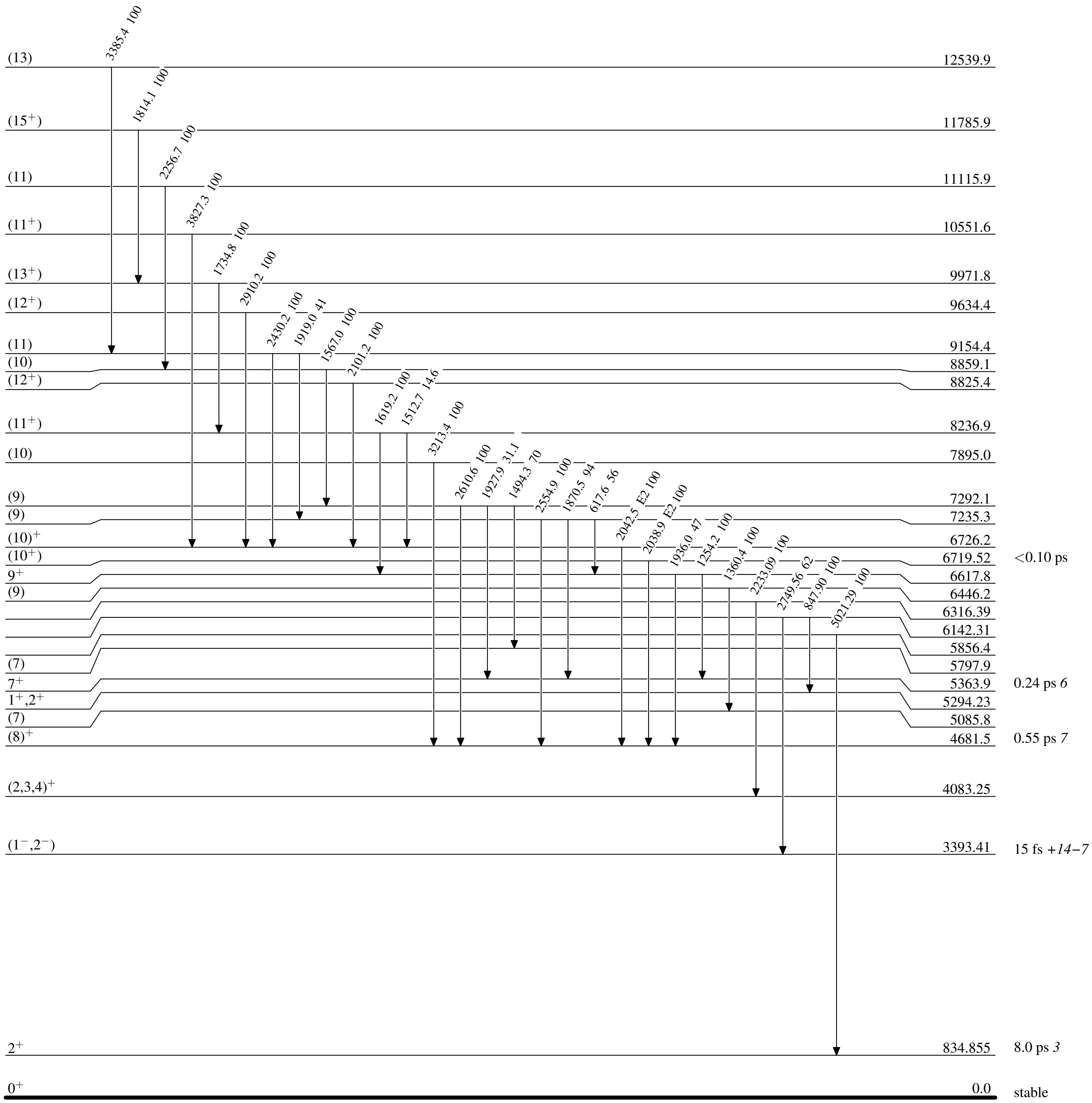
$\gamma(^{54}Cr)$ (continued)

† From (n,γ),(pol n,γ) E=th, except as noted.
‡ From ^{54}V β^- decay.
# From (α,pγ).
@ From weighted average of values in (n,γ),(pol n,γ) E=th and ^{54}V β^- decay.
& From weighted average of values in (α,pγ) and ^{54}V β^- decay.
[a] From (^{48}Ca,α2nγ).
[b] Branching ratio from (n,γ),(pol n,γ) E=th, except as noted.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

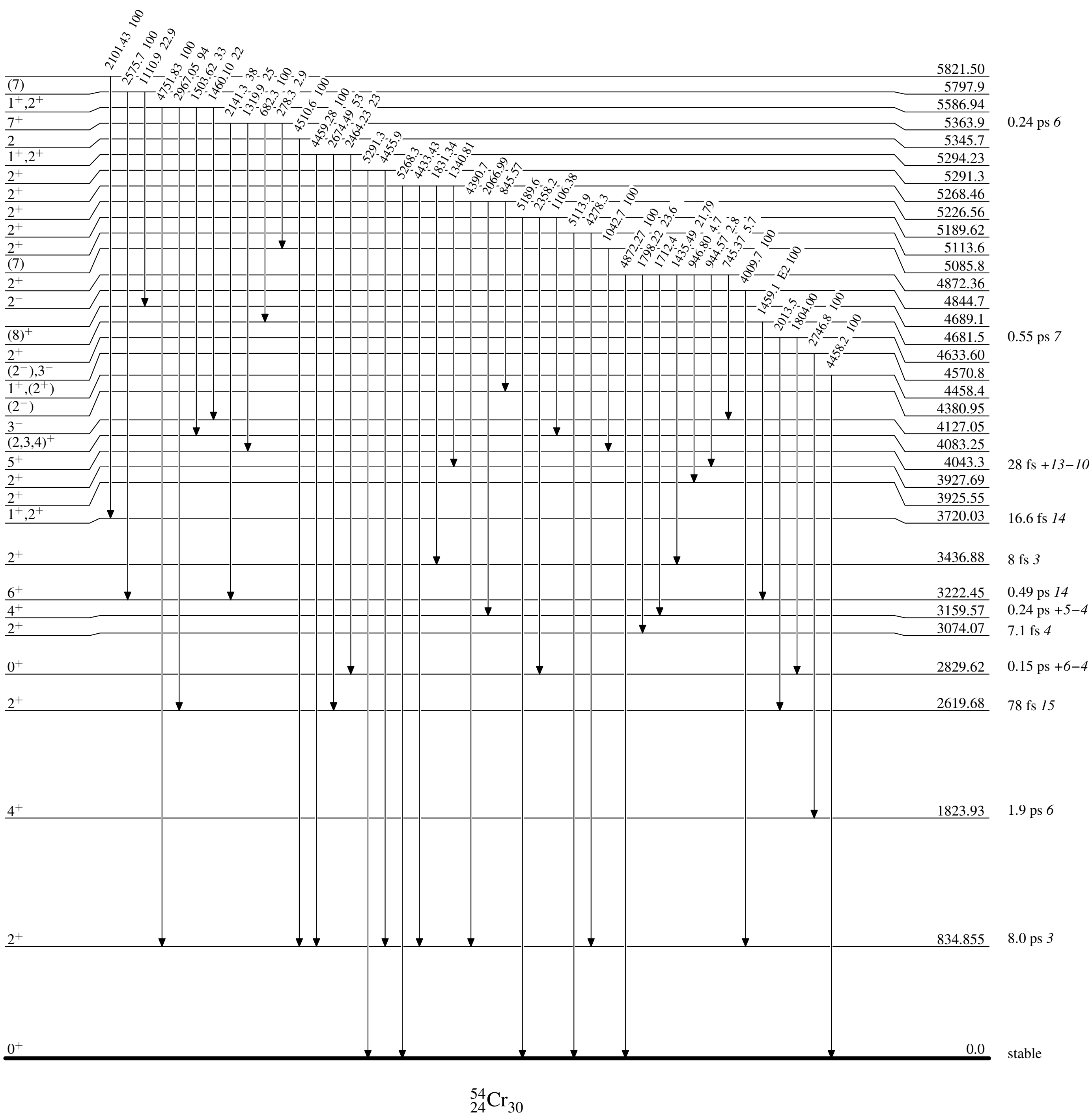


$^{54}_{24}Cr_{30}$

Adopted Levels, Gammas

Level Scheme (continued)

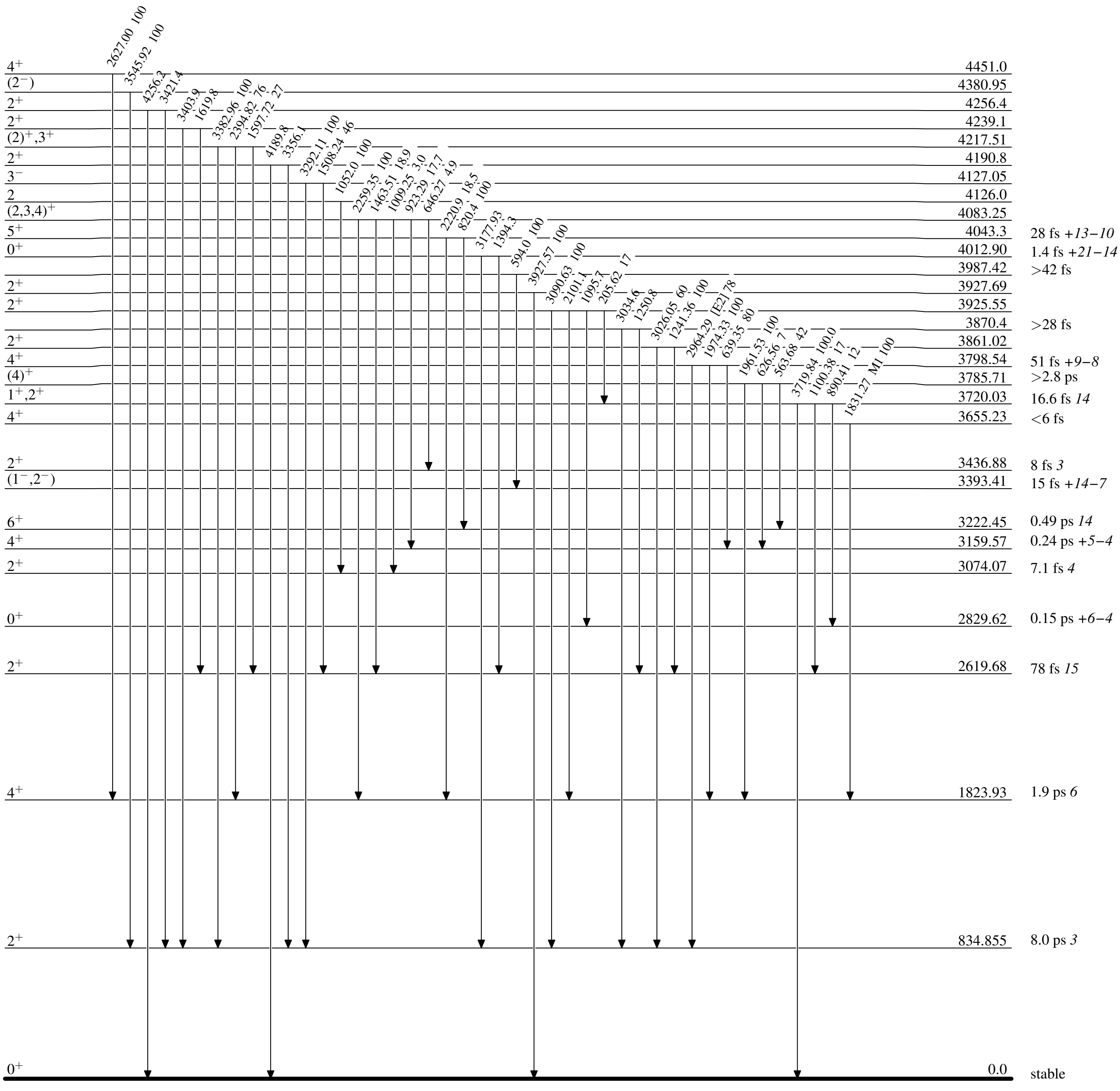
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

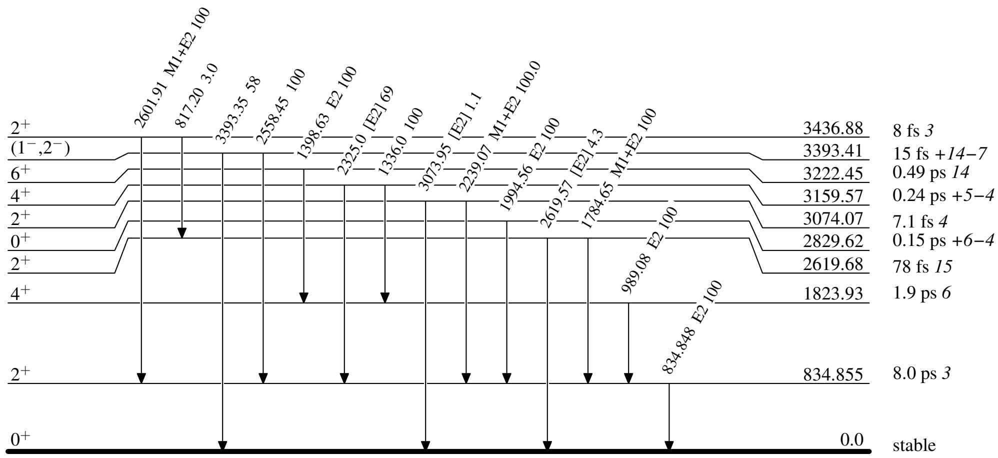


$^{54}_{24}Cr_{30}$

Adopted Levels, Gammas

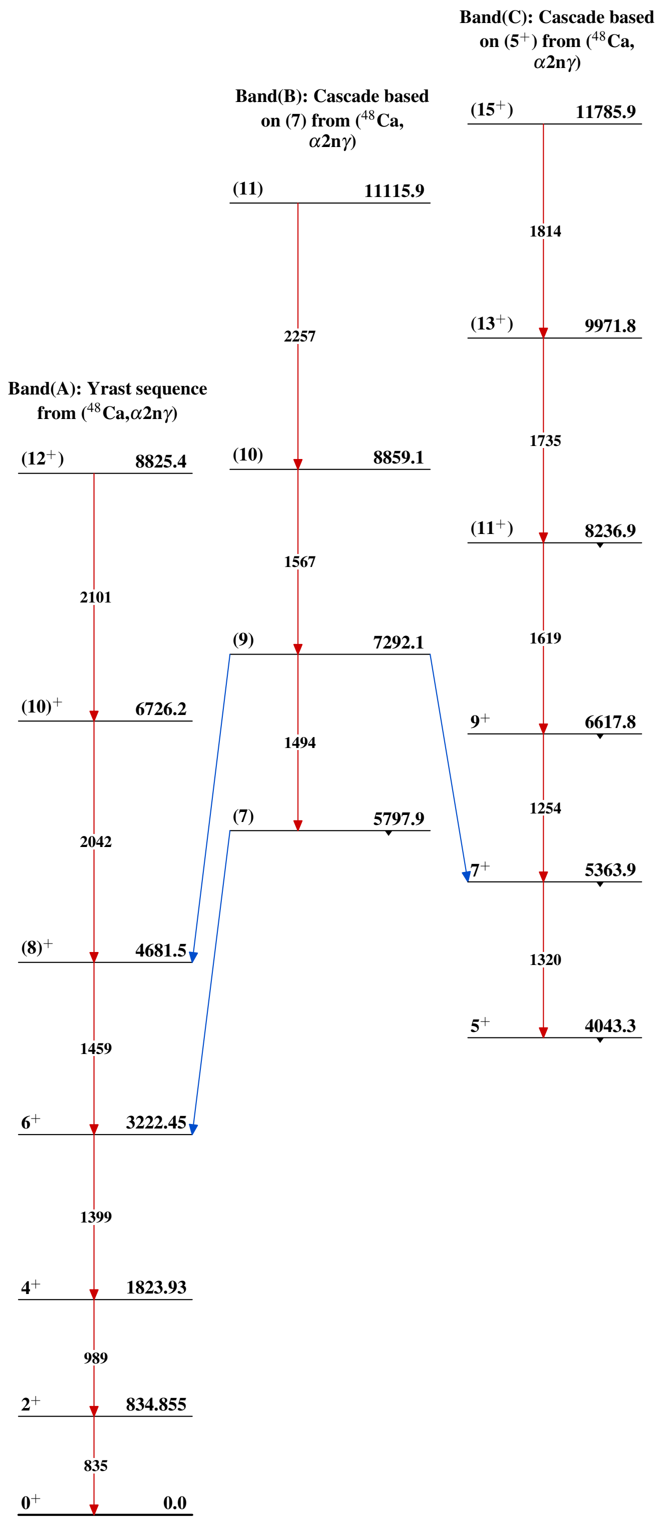
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{54}_{24}Cr_{30}$

Adopted Levels, Gammas



$^{54}_{24}Cr_{30}$

Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	25-Mar-2022

Q(β^-)=1626.5 *6*; S(n)=8246.1 *6*; S(p)=13449 *27*; Q(α)=−8232.3 *28* 2021Wa16
S(2n)=14492.4 *6*, S(2p)=24119 *16* (2021Wa16).

1960Dr03: ^{56}Cr produced and identified in bombardment of natural chromium metal electroplated on a gold backing with 2.7-2.9 MeV tritons from Los Alamos accelerator, followed by chemical separation of ^{56}Cr, identified by growth of 2.6-h ^{56}Mn activity. Measured Eγ, Iγ, $\beta\gamma$-coin, $T_{1/2}$ of decay of ^{56}Cr to ^{56}Mn. Since the 1960Dr03 work, no other investigation of half-life of ^{56}Cr or its decay appears to have been made.

Earlier attempts by 1956Jo32, by L.P. Roy and L. Yaffe (Can. Jour. Chem. 35, 156 (1957), and by 1960Eh04 were unsuccessful to identify ^{56}Cr activity.

Mass measurement: 2005Gu27.

Additional information 1.

Other reactions:

1992Wa11: ^{56}Fe(π^-,π^+),E=295 MeV: measured pions, $\sigma(\theta)$; deduced double giant dipole resonance.

1987Gi04: ^{56}Fe(π^-,π^+),E=100-292 MeV: measured σ; deduced nonanalog and double analog transitions.

1982Se09, 1981Pr02, 1978De30: ^{59}Co(π^-,pd),E at rest: measured $\sigma(\theta)$, (particle)(particle)-coin; deduced yields, and missing mass spectra.

Theoretical calculations: 46 primary reference extracted from the NSR database (www.nndc.bnl.gov/nsr/), listed here under document records.

^{56}Cr Levels

Cross Reference (XREF) Flags

A	^{56}V β^- decay (216 ms)	E	^{54}Cr(t,pγ)
B	^{9}Be(^{57}Cr,^{56}Crγ)	F	^{54}Cr(α,^{2}He)
C	^{48}Ca(^{11}B,2npγ)	G	^{238}U(^{48}Ca,Xγ)
D	^{54}Cr(t,p)	H	Coulomb excitation

E(level)[†]	J$^\pi$	$T_{1/2}$	XREF	Comments
0.0[‡]	0$^+$	5.94 min *10*	ABCDEFGH	%β^-=100 $T_{1/2}$: from 1960Dr03.
1006.83[‡] *10*	2$^+$	3.82 ps *10*	ABCDE GH	J$^\pi$: E2 γ to 0$^+$; L(t,p)=2. $T_{1/2}$: Weighted average of 3.81 ps *10* (2011Se09, recoil-distance method in (^{11}B,2npγ)) and 5.0 ps *+26−13* (2005Bu29, B(E2)(W.u.) in Coulomb excitation). Other: ≥1.4 ps from DSAM in (t,pγ) (1976Ba45).
1675.2 *4*	(0$^+$)		A	J$^\pi$: log *ft*=4.6 from 1$^+$ parent; shell-model prediction (see Fig. 13 in 2006Zh42 for a predicted 0$^+$ state at 1991 keV). However, note that no 0$^+$ state was found in (t,p) work of 1968Ch20 or in (t,pγ) work of 1976Ba45.
1831.65 *14*	2$^+$		ABCDE G	J$^\pi$: L(t,p)=2. Possible bandhead of γ band.
2076.81[‡] *14*	4$^+$	2.18 ps *8*	BC G	J$^\pi$: ΔJ=2, E2 γ to 2$^+$; J not 0 from $\gamma(\theta)$ distribution. $T_{1/2}$: from recoil-distance method in (^{11}B,2npγ) (2011Se09).
2278.49 *17*	(3$^+$)		BC G	J$^\pi$: ΔJ=1, dipole γ to 2$^+$; possible member of γ band. J=1 is less likely due to yrast-pattern of level population in (^{48}Ca,Xγ).
2325.9 *5*	2$^+$	≤0.055 ps	A DE	J$^\pi$: L(t,p)=2. $T_{1/2}$: from DSAM in (t,pγ).
2681.8 *10*	(4$^+$)	≥0.7 ps	CdEF	$T_{1/2}$: from DSAM in (^{11}B,2npγ) (1977Na12). J$^\pi$: L(t,p)=4 for 2682 and/or 2688 level.
2687.91 *20*	(4$^+$)		d G	J$^\pi$: L(t,p)=4 for 2682 and/or 2688 level; ΔJ=1, dipole γ to (3$^+$); possible member of γ band.
2822.93 *18*	(4$^+$)		G	J$^\pi$: ΔJ=0, dipole γ to 4$^+$.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{56}Cr Levels (continued)

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
3116.7 *6*			G	J$^\pi$: γ to 4$^+$ suggests J=4,5,6$^+$.
3164 *6*	(2$^+$,3,4$^+$)	≤0.21 ps	DE	J$^\pi$: γs to 2$^+$ and (4$^+$). T$_{1/2}$: from DSAM in (t,pγ).
3251.84‡ *17*	6$^+$	≥0.7 ps	BC G	J$^\pi$: ΔJ=2, E2 γ to 4$^+$; band member. T$_{1/2}$: from DSAM in (^{11}B,2npγ) (1977Na12).
3402 *20*			D	
3451 *15*	3$^-$		D	J$^\pi$: L(t,p)=3.
3509 *15*	2$^+$		D	J$^\pi$: L(t,p)=2.
3528.51 *22*	(5$^+$)		G	J$^\pi$: ΔJ=1 dipole γ to (4$^+$); γ to (3$^+$).
3648 *15*			D	
3675 *15*			D	
3794 *15*	3$^-$		D	J$^\pi$: L(t,p)=3.
3819 *20*			D	
3841.15 *19*	6$^{(+)}$		C G	J$^\pi$: ΔJ=2, quadrupole γ to 4$^+$; ΔJ=0, D+Q γ to 6$^+$.
3897 *15*	0$^+$		D	J$^\pi$: L(t,p)=0.
3916 *20*			D	
4014 *15*			D	
4112 *15*			D	
4157.56 *20*	(5,6,7$^+$)		G	J$^\pi$: γs to 6$^+$ and (5$^+$).
4175 *15*			D	
4247 *20*			D	
4284 *15*			D	
4349 *15*			D	
4445 *15*			D	E(level): energy is close to that of 4448.9, (7$^-$) level, however, it seems unlikely that L=7 is populated in (t,p) reaction.
4447.79# *20*	(7$^-$)	≥0.7 ps	C FG	J$^\pi$: L(α,^{2}He)=(7); ΔJ=1, dipole γ to 6$^+$. T$_{1/2}$: from DSAM in (^{11}B,2npγ) (1977Na12).
4631 *15*			D	
4678 *15*			D	
4732.53 *22*	(6$^+$,7$^+$)		G	J$^\pi$: γ to (5,6,7$^+$); γ from (8$^+$); possible γ to (5$^+$).
4750.95‡ *19*	8$^+$		C G	J$^\pi$: ΔJ=2, quadrupole γ to 6$^+$; band member.
4800 *20*			D	
4848 *20*			D	
4892 *20*			D	
4924 *20*			D	
4989 *15*			D	
5060	(5$^-$)		F	J$^\pi$: L(α,^{2}He)=(5).
5121 *15*	(3$^-$)		D	J$^\pi$: L(t,p)=(3).
5268.4 *3*	(8$^+$)		G	J$^\pi$: γ to 6$^{(+)}$; ΔJ=1, dipole γ from (9$^-$).
5601.44# *20*	(9$^-$)		C G	J$^\pi$: ΔJ=2, E2 γ to (7$^-$); ΔJ=1, dipole γ to 8$^+$.
5990	(5$^-$)		F	E(level): unresolved from 6200-keV peak. J$^\pi$: L(α,^{2}He)=(5) for 5990+6200.
6200	(5$^-$)		F	E(level): unresolved from 5990-keV peak. J$^\pi$: L(α,^{2}He)=(5) for 5990+6200.
6295.3 *8*	(8$^+$,9,10$^+$)		G	J$^\pi$: γ to 8$^+$; γ from 10$^+$.
6518.3‡ *3*	10$^+$		G	J$^\pi$: ΔJ=2, quadrupole γ to 8$^+$; band member.
6872.89 *22*			G	J$^\pi$: γ to 8$^+$ suggests J=8,9,10$^+$.
6879.0 *3*	(9,10,11$^-$)		C G	J$^\pi$: γ to (9$^-$).
7057.16# *22*	(11$^-$)		C G	J$^\pi$: ΔJ=2, quadrupole γ to (9$^-$); band member.
7330	(6$^+$,8$^+$)		F	J$^\pi$: L(α,^{2}He)=(6+8).
7691.9? *3*			G	
8465.5‡ *17*	12$^+$		G	J$^\pi$: γ to 10$^+$; band member.
8768.0# *3*	(13$^-$)		C G	J$^\pi$: ΔJ=2, quadrupole γ to (11$^-$); band member.

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Adopted Levels, Gammas (continued)

^{56}Cr Levels (continued)

E(level)†	J$^{\pi}$	XREF	Comments
10849.9# *5*	(15⁻)	G	J$^{\pi}$: γ to (13⁻); band member.
13159.4# *11*	(17⁻)	G	J$^{\pi}$: γ to (15⁻); band member.

† From least-squares fit to Eγ data for levels populated in γ-ray studies. Reduced χ^2 of 2.3 is slightly larger than 2.0 for 95% confidence level. Energies for levels, not populated in γ-ray studies are from ^{54}Cr(t,p).

‡ Band(A): g.s. band.

Band(B): Band based on (7⁻), 4448.0.

γ(^{56}Cr)

E$_i$(level)	J$^{\pi}_i$	E$_{\gamma}$†	I$_{\gamma}$	E$_f$	J$^{\pi}_f$	Mult.@	δ	Comments
1006.83	2⁺	1006.8 *1*	100	0.0	0⁺	E2		B(E2)(W.u.)=11.25 *30* B(E2)(W.u.)=8.7 *30* measured from Coulomb excitation cross section (2005Bu29), which gives level T$_{1/2}$=5.0 ps *+26−13*.
1675.2	(0⁺)	668.4 *3*	100	1006.83	2⁺			E$_{\gamma}$: from ^{56}V β^- decay.
1831.65	2⁺	824.8 *1*	100 *6*	1006.83	2⁺	M1+E2	−1.8 *10*	I$_{\gamma}$,δ: from (t,pγ). Mult.: from γ(pol) data in (^{11}B,2npγ).
		1830# *10*	18# *6*	0.0	0⁺	Q		Mult.: from $\gamma(\theta)$ in (t,pγ) (1976Ba45).
2076.81	4⁺	1070.0 *1*	100	1006.83	2⁺	E2		B(E2)(W.u.)=14.6 *6* Mult.: ΔJ=2, quadrupole from $\gamma(\theta)$ and DCO in (^{48}Ca,Xγ); and RUL for E2 and M2 transitions.
2278.49	(3⁺)	446.8 *1*	100	1831.65	2⁺	D		E$_{\gamma}$: from (^{48}Ca,Xγ) (2006Zh42). Other: 450.1 *7* in (^{11}B,2npγ) (2003Ap01). Values of Eγ in the two studies differ significantly, however, it appears less likely that there are two closely-spaced J=3 levels.
2325.9	2⁺	495.5#	<6#	1831.65	2⁺			
		1318.0 *6*	100 *11*	1006.83	2⁺	D(+Q)	+0.17 *30*	I$_{\gamma}$,Mult.,δ: from (t,pγ).
		2327.6#	<6#	0.0	0⁺			
2681.8	(4⁺)	359# *13*	31# *9*	2325.9	2⁺			
		850.1 *10*	39 *9*	1831.65	2⁺			E$_{\gamma}$: from (^{11}B,2npγ) (1977Na12). I$_{\gamma}$: from (t,pγ).
		1680# *15*	100# *12*	1006.83	2⁺			
2687.91	(4⁺)	409.4‡ *1*	100‡	2278.49	(3⁺)	D		
2822.93	(4⁺)	746.1‡ *1*	100‡	2076.81	4⁺	D		
3116.7		1039.9‡ *5*	100‡	2076.81	4⁺			
3164	(2⁺,3,4⁺)	479# *14*	33# *24*	2681.8	(4⁺)			
		835#& *15*	≤33#	2325.9	2⁺			
		1330#& *10*	≤33#	1831.65	2⁺			
		2158# *6*	100# *13*	1006.83	2⁺	D+Q,Q		Mult.: from $\gamma(\theta)$ in (t,pγ). δ(Q/D)=+1.0 *11* for J(3166)=2, δ=+2.1 *16* for J(3166)=3. δ(O/Q)=+0.18 *18* for J(3166)=4 in (t,pγ).
3251.84	6⁺	1175.1 *1*	100	2076.81	4⁺	E2		B(E2)(W.u.)<28

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Adopted Levels, Gammas (continued)

$\gamma(^{56}Cr)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ	E_f	J^π_f	Mult.@	δ	Comments
								Mult.: from $\gamma(\theta)$ and γ(pol) in (^{11}B,2npγ).
3528.51	(5$^+$)	704.0‡ *10*	100‡ *7*	2822.93	(4$^+$)	D		
		839.0‡ *10*	56‡ *4*	2687.91	(4$^+$)	D		
		1248.4‡ *10*	44‡ *5*	2278.49	(3$^+$)			
3841.15	6$^{(+)}$	589.2 *1*	100 *4*	3251.84	6$^+$	D+Q	≈+1.2	E_γ,I_γ,Mult.,δ: from (^{48}Ca,Xγ). Other Eγ=587.6 *6* in (^{11}B,2npγ).
		1763.8‡ *4*	78‡ *4*	2076.81	4$^+$	Q		
4157.56	(5,6,7$^+$)	629.0‡ *1*	4.0‡ *11*	3528.51	(5$^+$)			
		905.7‡ *1*	100‡ *5*	3251.84	6$^+$			
4447.79	(7$^-$)	606.5 *1*	37 *5*	3841.15	6$^{(+)}$			E_γ: from (^{48}Ca,Xγ). Ordering of the 588γ − 609γ cascade in (^{11}B,2npγ) (2003Ap01) reversed in (^{48}Ca,Xγ) (2006Zh42). Eγ=608.8 *6* in (^{11}B,2npγ). I_γ: unweighted average of 32.4 *11* in (^{48}Ca,Xγ) and 41.5 *15* in (^{11}B,2npγ).
		1196.3 *2*	100 *3*	3251.84	6$^+$	D		I_γ: from (^{48}Ca,Xγ).
4732.53	(6$^+$,7$^+$)	574.9‡ *1*	100‡ *5*	4157.56	(5,6,7$^+$)			
		1205.5‡& *10*	21.2‡ *27*	3528.51	(5$^+$)			
4750.95	8$^+$	1499.2 *1*	100	3251.84	6$^+$	Q		
5268.4	(8$^+$)	534.9‡ *4*	62‡ *5*	4732.53	(6$^+$,7$^+$)			
		1426.9‡ *6*	100‡ *11*	3841.15	6$^{(+)}$			
5601.44	(9$^-$)	332.7‡ *2*	2.80‡ *24*	5268.4	(8$^+$)	D		
		850.6 *1*	36 *6*	4750.95	8$^+$	D		E_γ: from (^{48}Ca,Xγ). Other: Eγ=848.6 *6* in (^{11}B,2npγ). I_γ: unweighted average of 29.6 *12* in (^{48}Ca,Xγ) and 41.7 *15* in (^{11}B,2npγ).
		1153.6 *1*	100 *3*	4447.79	(7$^-$)	E2		I_γ: from (^{48}Ca,Xγ). Mult.: from $\gamma(\theta)$ and γ(pol) in (^{11}B,2npγ).
6295.3	(8$^+$,9,10$^+$)	1544.3‡ *10*	100‡	4750.95	8$^+$			
6518.3	10$^+$	222.9‡ *10*	6.0‡ *12*	6295.3	(8$^+$,9,10$^+$)			
		1767.3‡ *2*	100‡ *8*	4750.95	8$^+$	Q		
6872.89		2121.9‡ *1*	100‡	4750.95	8$^+$			
6879.0	(9,10,11$^-$)	1277.5 *2*	100	5601.44	(9$^-$)			E_γ: from (^{48}Ca,Xγ). Other: 1282.8 *10* in (^{11}B,2npγ).
7057.16	(11$^-$)	1455.7 *1*	100	5601.44	(9$^-$)	Q		
7691.9?		812.9‡& *1*	100‡	6879.0	(9,10,11$^-$)			
8465.5	12$^+$	1947.2 *16*	100	6518.3	10$^+$			
8768.0	(13$^-$)	1710.8 *2*	100	7057.16	(11$^-$)	Q		Mult.: from $\gamma(\theta)$ in (^{11}B,2npγ).
10849.9	(15$^-$)	2081.9‡ *3*	100‡	8768.0	(13$^-$)			
13159.4	(17$^-$)	2309.4‡ *10*	100‡	10849.9	(15$^-$)			

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Adopted Levels, Gammas (continued)

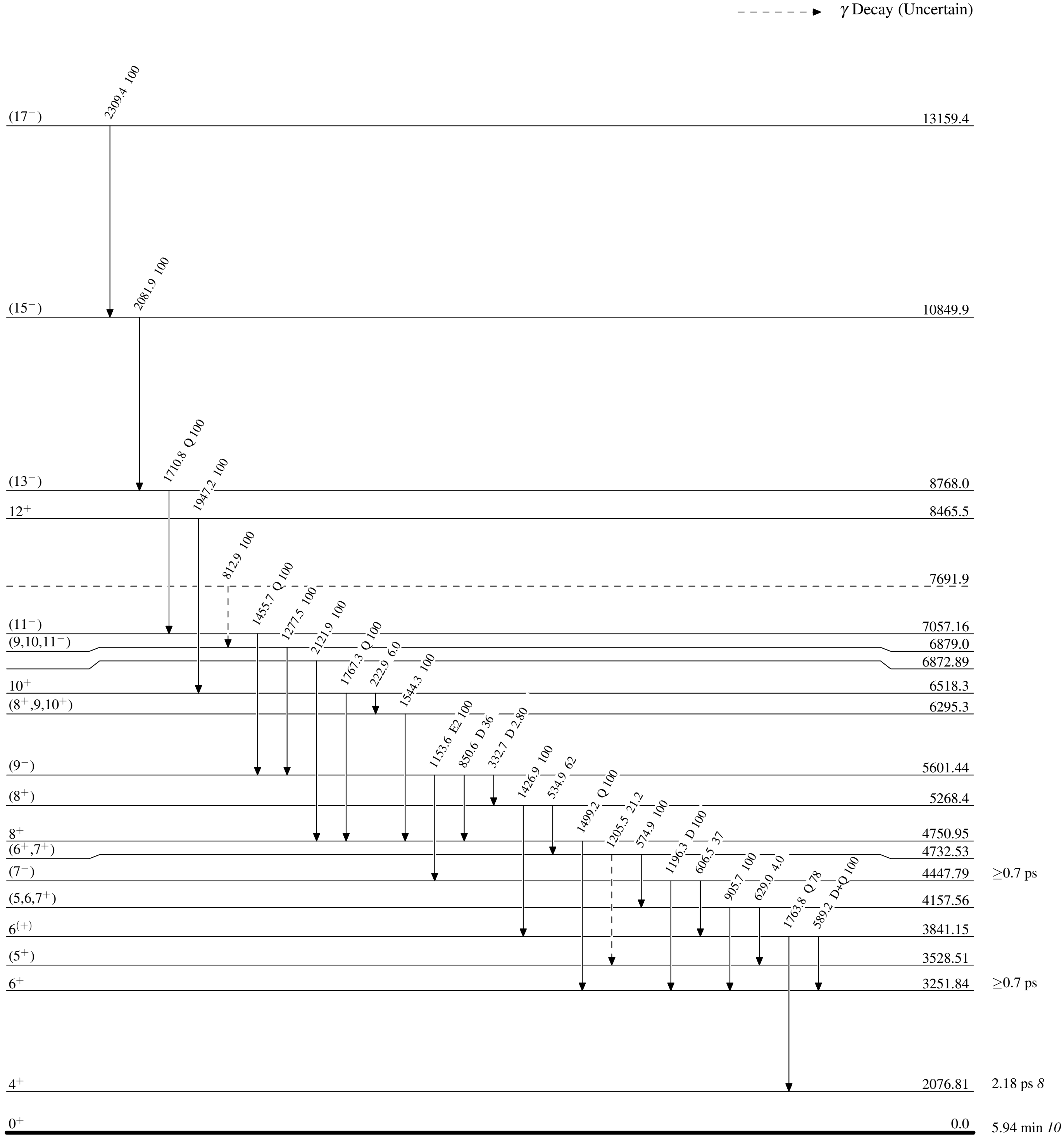
$\gamma(^{56}Cr)$ (continued)

† From weighted averages of available data in β^- decay, $^{48}Ca(^{11}B,2np\gamma)$, (t,p$\gamma$) and $^{238}U(^{48}Ca,X\gamma)$, except as noted.
‡ γ from $^{238}U(^{48}Ca,X\gamma)$ only.
# γ from (t,pγ) only.
@ From $\gamma(\theta)$ and $\gamma\gamma(\theta)$(DCO) in ($^{48}Ca,X\gamma$), unless specified otherwise.
& Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

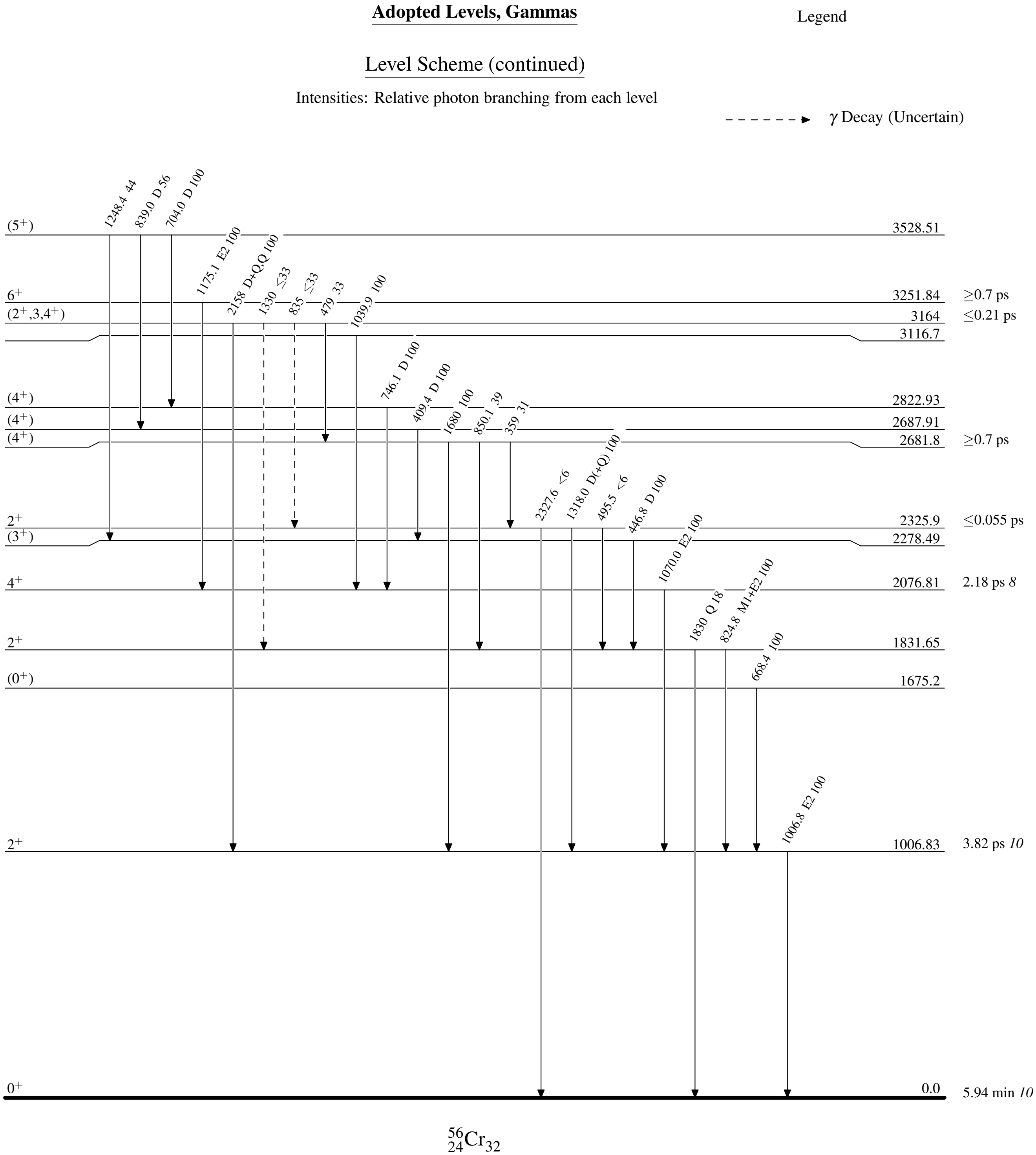


$^{56}_{24}Cr_{32}$

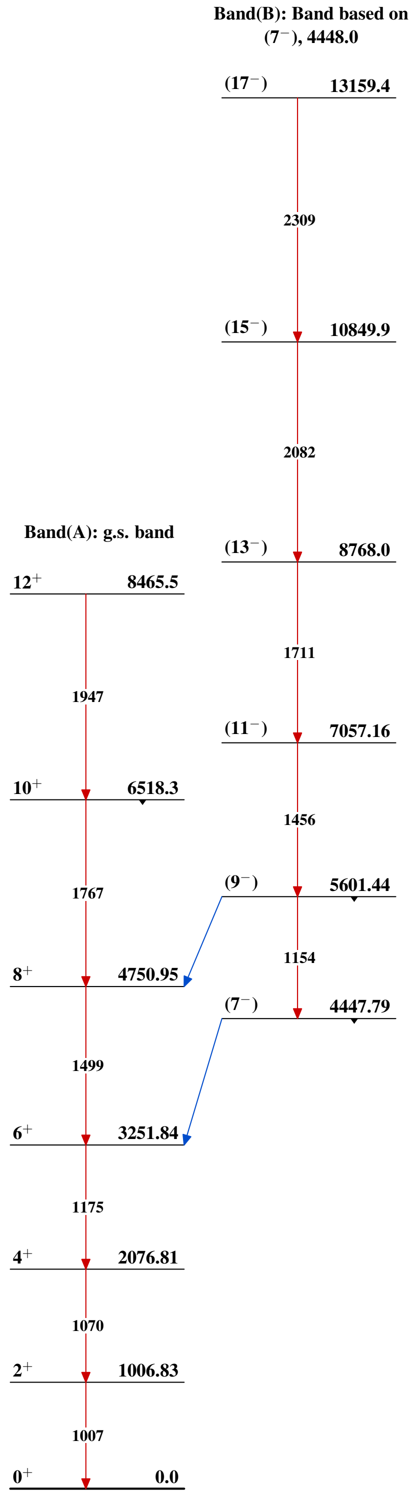
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{56}_{24}Cr_{32}$