Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 151, 1 (2018)	1-Apr-2018

Q(β^-)=7.44×10^3 *21*; S(n)=4.17×10^3 *22*; S(p)=1.497×10^4 *23*; Q(α)=−8.84×10^3 *27* 2017Wa10

Measured mass excess: −48132 keV *20* (2018Mo14).

Production: on-line mass separation of products from W(^{76}Ge,x), E(^{76}Ge)=11.5 MeV/nucleon (1988Bo06,1985Bo49); fragmentation of 64.5 MeV/nucleon ^{65}Cu beam by ^{9}Be (1996Do23); 60.3 MeV/nucleon ^{86}Kr beam fragmentation by Ni (1998Gr14); ^{59}V β^- decay (1999So20).

^{59}Cr Levels

Cross Reference (XREF) Flags

- A ^{59}V β^- decay
- B ^{59}Cr IT decay (96 μs)
- C ^{13}C(^{48}Ca,2pγ)

E(level)†	J$^\pi$‡	$T_{1/2}$	XREF	Comments
0.0	(1/2$^-$)	0.74 s *28*	ABC	%β^-=100 $T_{1/2}$: From 1.0 s *4* (1985Bo49 − coin β-1238γ(t)), 0.6 s *3* (1988Bo06 − coin β-112γ(t)), 0.46 s *5* (1996Do23 − β(t) and $\beta\gamma$(t)), and 1.05 s *9* (2005Li53 − 1238γ(t)) − using the limitation of statistical weight method (1985ZiZY). Discrepant dataset. Weighted average is 0.74 s *6*. Values reported in 1985Bo49, 1988Bo06, and 1996Do23 are from the same research group. 1996Do23 note new value is better compared to earlier ones due to better accuracy of isotope-separation over mass-separation (1985Bo49, 1988Bo06). However, 2005Li53 verify consistency of their ^{59}Cr and ^{59}V half-life values. The evaluator recommends a value from these discrepant datasets. Possible (ν 1/2[321]) oblate configuration (see J^π footnote).
207.4 *3*	(3/2$^-$)		ABC	Possible (ν 3/2[321]) oblate configuration (see J^π footnote).
309.7 *4*	(5/2$^-$)		ABC	Possible (ν 5/2[312])$^{-1}$ oblate configuration (see J^π footnote).
502.7 *11*	(9/2$^+$)	96 μs *20*	B	$T_{1/2}$: from ^{59}Cr IT decay (1998Gr14). Possible (ν 9/2[404]) intruder oblate configuration (see J^π footnote).
524.4?# *5*			A	
800.0 *4*			A	
827.7 *4*	(7/2$^-$)@		C	
915.3 *4*			A	
1083.8? *11*	(9/2)$^-$@		C	
1315.9 *11*	(13/2$^+$)@		C	
1340.7 *5*			A	
1365.6 *5*			A	
1531.8?# *5*			A	
2509.0? *8*			A	

† From least-squares fit to Eγ.

‡ Possible values suggested in 1999So20, except otherwise noted. For small to moderate deformations, a (ν f$_{5/2}$) g.s. configuration is expected, with the 35th neutron occupying the 3/2[301] and 1/2[321] orbitals, respectively, for prolate and oblate deformations. QRPA calculations predict prolate and oblate configurations 480 keV apart (1999So20), so ^{59}Cr possibly exhibits shape

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{59}Cr Levels (continued)

coexistence. 1998Gr14 suggest that the 503-keV isomeric level is analogous to $g_{9/2}$ intruder states known in several nuclides with N≈40 and Z≈28 which de-excite via an M2 transition to a $5/2^-$ ($\nu f_{5/2}$) state (e.g., in ^{61}Fe, ^{67}Ni). For oblate deformation, the 1/2[321], 3/2[321] and 9/2[404] orbitals can lie quite close in energy, and a $5/2^-$ state could arise from a hole in the 5/2[312] orbital. For prolate deformation, a $9/2^+$ state would lie at very high excitation (see, e.g., fig. 7 of 1998So03), so oblate deformation is favored for ^{59}Cr.

[#] The ordering of the 841-317 and 1222-977 cascades are uncertain thus the location of the 525 and 1532 levels would be different if the orderings are reversed.

[@] Proposed in 2004Fr17 on the basis of ^{59}Cr β^-decay to ^{59}Mn, γ-ray placement, analysis of transition strengths, and assumption of yrast state feeding.

$\gamma(^{59}Cr)$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	Comments
207.4	$(3/2^-)$	207.4 *3*	100	0.0	$(1/2^-)$		E_γ: Weighted average of 207.8 *4* (^{59}V β^- decay), 208 *1* (^{59}Cr IT decay (96 μs)), and 207.1 *3* (^{48}Ca,2pγ).
309.7	$(5/2^-)$	102.5 *2*	100	207.4	$(3/2^-)$		E_γ: Weighted average of 102.0 *4* (^{59}V β^- decay), 102 *1* (^{59}Cr IT decay (96 μs)), and 102.7 *2* (^{48}Ca,2pγ).
502.7	$(9/2^+)$	193[@] *1*	100	309.7	$(5/2^-)$	[M2]	B(M2)(W.u.)=0.080 *17* Mult.: RUL eliminates E3, M3 and higher multipolarities; M2 favored by analogy with isomeric states in neighboring nuclides. 1999So20 conclude that the 193γ is the isomeric transition rather than the 208γ (suggested in 1998Gr14) because the 208γ and 102γ are present in ^{59}V β^- decay but the 193γ is not.
524.4?		317.3[#] *4*	100	207.4	$(3/2^-)$		
800.0		490.8 *5*	55 *10*	309.7	$(5/2^-)$		
		592.4 *4*	100 *7*	207.4	$(3/2^-)$		
		799.9 *5*	26 *7*	0.0	$(1/2^-)$		
827.7	$(7/2^-)$	518.0[‡] *2*	100	309.7	$(5/2^-)$		
915.3		606.0 *4*	100 *6*	309.7	$(5/2^-)$		
		707.6 *5*	17 *5*	207.4	$(3/2^-)$		
1083.8?	$(9/2)^-$	256[‡a] *1*	100	827.7	$(7/2^-)$		
1315.9	$(13/2^+)$	813.2[‡] *3*	100	502.7	$(9/2^+)$		
1340.7		425.5 *4*	71 *13*	915.3			
		1030.8 *4*	100 *13*	309.7	$(5/2^-)$		
1365.6		841.4[#] *4*	100 *11*	524.4?			
		1157.8 *5*	30 *7*	207.4	$(3/2^-)$		
1531.8?		1222.1[&] *4*	100	309.7	$(5/2^-)$		
2509.0?		977.2[&] *5*	64 *9*	1531.8?			
		1593.4[a] *5*	100 *18*	915.3			
		2198.7[a] *5*	23 *9*	309.7	$(5/2^-)$		

[†] From ^{59}V β^- decay, except as noted.

[‡] From (^{48}Ca,2pγ).

[#] Ordering of the 841-317 cascade not determined with certainty (^{59}V β^- decay – 2005Li53).

[@] From ^{59}Cr IT decay (96 μs).

[&] Ordering of the 1222-977 cascade not determined with certainty (2005Li53).

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

Adopted Levels, Gammas

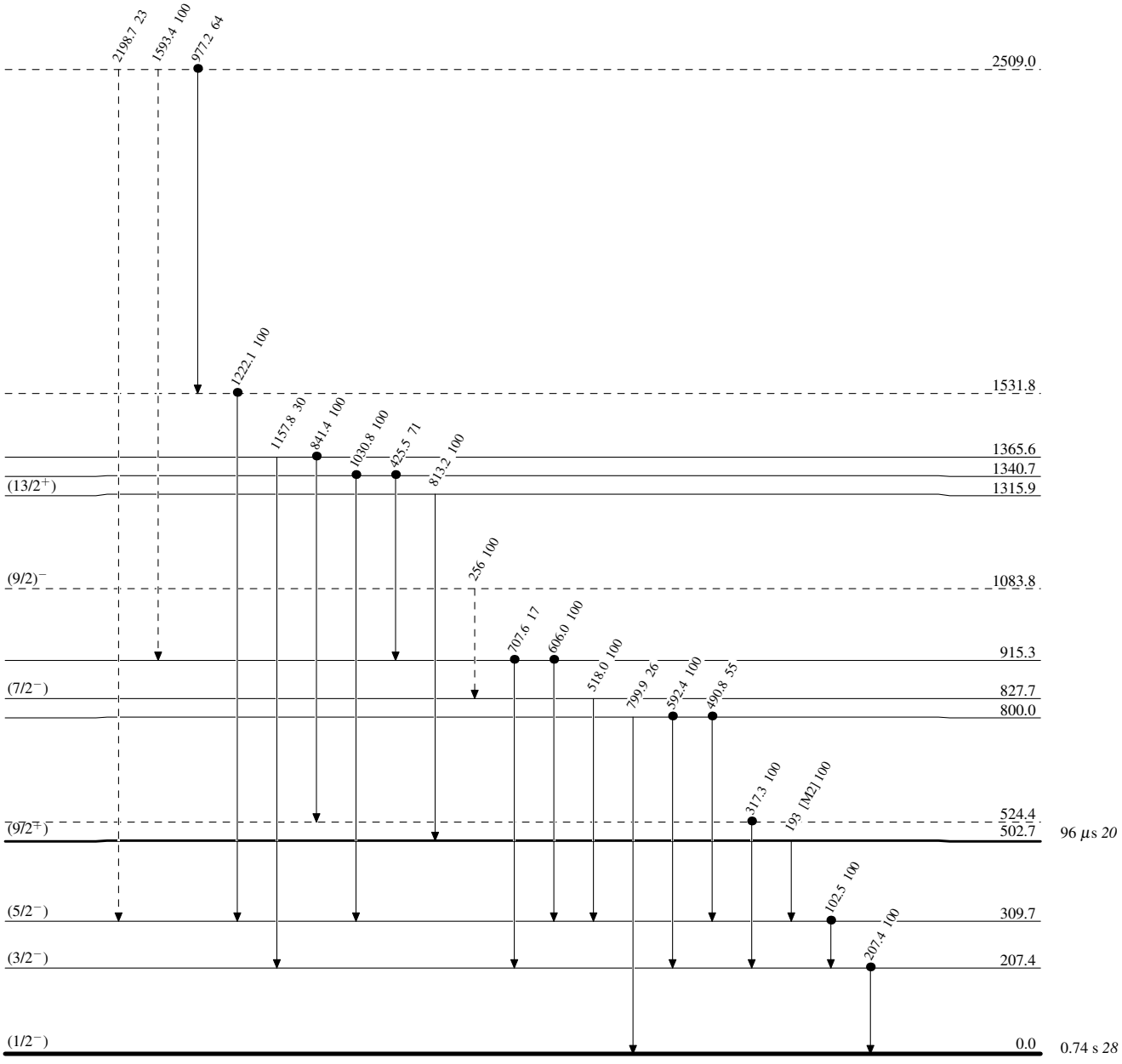
Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

Coincidence



$^{59}_{24}Cr_{35}$